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May 31, 2016

Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

RE: **Port Arthur LNG, LLC**
Response to Comments on Preliminary Draft Resource Reports 1 and 10
Docket No. PF15-18-000

Dear Ms. Bose:

On March 31, 2015 the Director of the Office of Energy Projects of the Federal Energy Regulatory Commission ("Commission") authorized Port Arthur LNG, LLC ("Port Arthur LNG") to commence the Commission's pre-filing review process with respect to Port Arthur LNG's proposed Port Arthur Liquefaction Project. Pursuant to Sections 157.21 (f) (5) and 380.12 (c) of the Commission's regulations, Port Arthur LNG hereby submits responses to comments received on Draft Resource Reports 1 and 10 in a letter from FERC staff dated June 25, 2015. As requested, this second version of Draft Resource Reports 1 and 10 in attachments 1 and 2 respectively, addresses comments received and includes a matrix describing the location within the documents where these comments are addressed.

Please note that some of the material filed herein contains Privileged and Confidential Information and Critical Energy Infrastructure Information ("CEII"). Attachment 1 includes drawings and/or information that contain proprietary information and CEII. Pursuant to Section 388.112 of the Commission's regulations, Port Arthur LNG requests that the Commission treat this information as privileged material. The information included in this attachment meets the Commission's definition of privileged material and treatment of this information as privileged is therefore warranted. Port Arthur LNG is submitting a public version of this filing, with the privileged material redacted. The privileged material has been labeled accordingly and is not to be released.

For questions concerning this submittal please contact Jim Thompson at 832-284-5685. Thank you for your attention to these matters.

Respectfully submitted,

/s/JD Morris

JD Morris
Director, Permitting & Compliance
Port Arthur LNG, LLC

cc: Jim Thompson
Bill Rapp
Bill Lansinger

Attachment 1

Draft Resource Report 1

Port Arthur Liquefaction Project

Note – Portions of the attachment include Privileged and Confidential information and have been removed from the Public version.

PORT ARTHUR LIQUEFACTION PROJECT

DRAFT RESOURCE REPORT NO. 1

GENERAL PROJECT DESCRIPTION

Submitted by:

Port Arthur LNG, LLC
2925 Briarpark Dr., Suite 900
Houston, TX 77042

May 2016

PORT ARTHUR LIQUEFACTION PROJECT

Draft Resource Report 1 – General Project Description	
To Verify Compliance with this Minimum FERC Filing Requirement:	**See the Following Resource Report Section:**
1. Provide a detailed description and location map of the project facilities. (§ 380.12(c)(1)) • Include all pipeline and aboveground facilities. • Include support areas for construction or operation. • Identify facilities to be abandoned.	Section 1.1.2 Section 1.6
2. Describe any nonjurisdictional facilities that would be built in association with the project. (§ 380.12(c)(2)) • Include auxiliary facilities. (§ 2.55(a)) • Describe the relationship to the jurisdictional facilities. • Include ownership, land requirements, gas consumption, megawatt size, construction status, and an update of the latest status of Federal, state, and local permits/approvals. • Include the length and diameter of any interconnecting pipeline. • Apply the four-factor test to each facility. (§ 380.12(c)(2)(ii))	Section 1.9
3. Provide current original U.S. Geological Survey (USGS) 7.5-minute-series topographic maps with mileposts showing the project facilities. (§ 380.12(c)(3) • Maps of equivalent detail are acceptable if legible (check with staff). • Show locations of all linear project elements, and label them. • Show locations of all significant aboveground facilities, and label them.	Section 1.10
4. Provide aerial images or photographs or alignment sheets based on these sources with mileposts showing the project facilities. (§ 380.12(c)(3)) • No more than 1-year old. • Scale no smaller than 1:6,000.	Section 1.10
5. Provide plot/site plans of compressor stations showing the location of the nearest noise-sensitive areas (NSA) within 1 mile. (§ 380.12(c)(3,4)) • Scale no smaller than 1:3,600. • Show reference to topographic maps and aerial alignments provided above.	No Compressor Station
6. Describe construction and restoration methods. (§ 380.12(c)(6)) • Include this information by milepost. • Make sure this is provided for offshore construction as well. For the offshore this information is needed on a mile-by-mile basis and will require completion of geophysical and other surveys before filing.	Section 1.3; Section 1.3.1.13

Draft Resource Report 1 – General Project Description	
To Verify Compliance with this Minimum FERC Filing Requirement:	**See the Following Resource Report Section:**
7. Identify the permits required for construction across surface waters. (§ 380.12(c)(9)) • Include the status of all permits. • For construction in the Federal offshore area be sure to include consultation with the MMS. File with the MMS for rights-of-way grants at the same time or before you file with the FERC.	Section 1.7 Table 1.7-1 No construction in Federal Offshore areas is proposed
8. Provide the names and address of all affected landowners and certify that all affected landowners will be notified as required in § 157.6(d). (§ 380.12(c)(10)) • Affected landowners are defined in § 157.6(d). • Provide an electronic copy directly to the environmental staff.	Section 1.8 Appendix 1D
Additional Information Often Missing and Resulting in Data Requests	
Describe all authorizations required to complete the proposed action and the status of applications for such authorizations.	Section 1.7 Table 1.7-1

Responses to Federal Energy Regulatory Commission

Comments on Preliminary Draft Resource Reports 1 and 10 - June 25, 2015

The following comments are applicable to both the Port Arthur Liquefaction Project and Port Arthur Pipeline Project (referred to collectively as the projects)

	FERC Comments	Location in RR1
1.	Provide all applicable agency correspondence. This includes letters, meeting notes, phone logs, and/or emails where substantive information has been discussed or received from relevant federal, state, and local agencies, and federally recognized Native American tribes.	Appendix 1A, Also in Appendix A in those Resource Reports where agency correspondence has occurred
2.	Provide an update regarding the status of environmental surveys. Where surveys are pending, identify the anticipated completion date and/or the reason for incomplete surveys (for example, landowner access denied).	The status and results of Environmental Surveys are presented in Resource Report 2 (waters of the US); Resource Report 3 (listed species); Resource Report 4 (cultural resources); and Resource Report 9 (ambient noise)

Responses to Federal Energy Regulatory Commission Comments on Preliminary Draft Resource Reports 1 and 10 - June 25, 2015		
3.	Regarding the cumulative impacts appendix, provide a table identifying the location, timeframe, and general scope (or region of influence) of recently completed, current, and reasonably foreseeable (planned) major projects (roads, bridges, housing developments, liquefied natural gas (LNG) facilities, gathering pipelines, gas plant extensions, railroad development, etc.) within an appropriately sized study zone. The size of the study zone should take into consideration the nature and location of the planned project facilities, the types of environmental impacts associated with the project, and the nature of the project area. Consider the location, scope, and timing of each project in determining whether it could have a cumulative impact on the resources affected by the Port Arthur Liquefaction and Pipeline Projects. Discuss cumulative impacts that the identified projects and the Port Arthur Liquefaction and Pipeline Projects would have on each applicable environmental resource, and the measures that Port Arthur LNG, LLC (PALNG) and Port Arthur Pipeline, LLC (PAPL) would implement to minimize cumulative impacts.	Appendix 1D Tables 1.10-1 & 1.10-2 Cumulative Impacts are assessed in the final section of each Resource Report
4.	Describe estimated temporary and permanent workforce requirements for construction and operation of the planned facilities. If appropriate, cross-reference to Resource Report 5 for additional workforce information.	Section 1.1.1 & RR5 Section 5.3 Appendix 5D
5.	Identify if PALNG and PAPL would implement a landowner complaint resolution process that would be used during construction, restoration, and operation of the project. If so, include information such as the format of communication (e.g., letter), when landowners would be notified of the procedures, contact number(s), and how quickly the issue would be responded to.	Section 1.8.2
The following comments are applicable to the Port Arthur LNG Project		
1.	Provide references or studies to support the statement that “the Project will result in a substantial improvement in the United States balance of trade…it will make a significant contribution to reducing the trade imbalance for a sustained period of time.”	Added ICF report reference Section 1.1.1
2.	Several tables and figures are referenced in the resource report that were not provided and/or not included in the table of contents. Provide these materials as available and appropriate.	All tables and figures have been incorporated and identified in the Table of Contents

Responses to Federal Energy Regulatory Commission Comments on Preliminary Draft Resource Reports 1 and 10 - June 25, 2015		
3.	It appears from section 1.1.1 there would be two construction phases, with the first of two trains commencing operations in Q1 2021 and the second train commencing operations in Q3 2021. Verify the number of construction phases and provide the quantity of gas each train/phase would be capable of producing for export in billion square feet per day.	Section 1.1.1
4.	Verify that the project would be consistent with President Obama's National Export Initiative signed in 2010.	Section 1.1.1
5.	Provide a table to clearly define the construction and operation acreage impacts for each project component. Use footnotes as appropriate to describe, for example, overlaps with existing facility footprints.	Table 1.2-1
6.	Clarify the multiple parties and roles respective to the permitting, construction, operation, relocation, and/or abandonment of each non-jurisdictional facility.	Tables 1.1-1 & 1.1-2
7.	Provide the following information for all non-jurisdictional facilities: a. company/owner; b. type of facility; c. dimensions (pipe diameter, length, dimensions, horsepower, etc. as appropriate for pipeline and land area for other facilities); d. maps showing locations of existing facilities and proposed relocated sites; e. federal permits required and their status; and f. status of local and state permits required.	Tables 1.1-1, 1.1-2, & 1.7-1
8.	Section 1.3 states that PALNG would adopt the FERC's Upland Erosion Control, Revegetation, and Maintenance Plan (Plan) and Wetland and Waterbody Construction and Mitigation Procedures (Procedures) in their entirety. However, section 1.1.3.2 states that wetlands developed at the LNG site would be filled to accommodate the project, which appears to conflict with section VI.A.6 of the FERC's Procedures, which states aboveground facilities should not be located in any wetland. Verify if PALNG would locate aboveground facilities in wetlands. Provide a justification for the modification and describe why PALNG's proposal provides better or equal protection.	Section 1.3
9.	Provide a general sequence of events or schedule for the project activities, including highway, pipeline, and utility relocations, electric power generation installation, and major liquefaction facility construction steps.	Section 1.3.1
10.	Identify where: a) site clearing material would be placed or relocated; and b) fill material would be obtained.	TBD

Responses to Federal Energy Regulatory Commission Comments on Preliminary Draft Resource Reports 1 and 10 - June 25, 2015			
11.	Provide copies of the geotechnical studies (referenced in section 1.3.2) conducted for the previously proposed import project.		Resource Report 6 Appendix 6A
12.	Add a subsection to this resource report that includes the following information on LNG carriers and transits (be sure to use this information in the remaining resource reports to characterize impacts):		
	a.	size and frequency of LNG carriers anticipated to call on the loading facility;	Section 1.1.2.3
	b.	maximum number of LNG carriers per year anticipated;	Section 1.1.2.3
	c.	transit route from the edge of the territorial sea to the loading dock; and	Section 1.1.2
	d.	time required for a carrier to be berthed at the dock.	Section 1.1.2.3
13.	Provide an update on utility relocation discussions per section 1.3.16.3.		See Utility Relocation under Section 1.3.2.1
14.	Describe PALNG's environmental training and inspection program.		Section 1.3.1.17
15.	Upon filing of a formal application, provide monthly updates to table 1.7-1, Permits, Approvals, Consultations, and Regulatory Requirements for the Project.		Table 1.7-1
16.	Update table 1.7-1 to include the U.S. Department of Energy authorization(s).		Table 1.7-1
17.	Update section 1.8 to incorporate any additional agency and public communications that have occurred to date for the planned project.		Section 1.8, Appendix 1A Note: also see Appendix A in each Resource Report where agency and public communications occurred
18.	Address the following regarding operation and maintenance of the liquefaction facility:		
	a.	clarify from where operations would be conducted (onsite control room, remotely, etc.); and	Section 1.4
	b.	provide additional details such as materials, sumps, and location of spill containment systems. In addition to the LNG container and LNG transfer system, also provide this information for the process area and refrigerant storage area.	Sections 1.5 & 1.5.1

Responses to Federal Energy Regulatory Commission Comments on Preliminary Draft Resource Reports 1 and 10 - June 25, 2015		
19.	Update section 1.9.2 to include a discussion of the pipeline and utility relocations in addition to the State Highway 87 relocation and electric power generation facility.	The text previously found in Section 1.9.2 has been moved to Section 1.1.3.1 and supplemented with text on SH 87
20.	Update figure 1.1-2 to: a) identify the temporary construction areas and permanent operational areas; and b) show the full extent of the project boundary to the northwest.	Figure 1.1-2
21.	Throughout draft Resource Report 1, different water sources are proposed to be utilized for different stages of the process (e.g., well water, municipal water, water from the Sabine Neches ship channel). Confirm that all of these sources would be utilized during construction, testing, and operation of the facilities. Indicate the amounts that would be withdrawn from each source and over what period. Provide information as to the impact of this withdrawal on each source. This information may be presented in Resource Report 2.	Section 1.1.2.7 Also see Testing under Section 1.3.1.12.3. Information has also been incorporated into RR2

DRAFT RESOURCE REPORT 1 – GENERAL PROJECT DESCRIPTION

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DRAFT RESOURCE REPORT 1 – GENERAL PROJECT DESCRIPTION

CONTENTS (Continued)

DRAFT RESOURCE REPORT 1 – GENERAL PROJECT DESCRIPTION

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CONTENTS (Continued)

APPENDICES

DRAFT RESOURCE REPORT 1 – GENERAL PROJECT DESCRIPTION

ACRONYMS AND ABBREVIATIONS

APCI	Air Products and Chemicals, Inc.
API	American Petroleum Institute
AQCR	Air Quality Control Region
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating, & Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ATC	Authorization To Construct
BMP	Best Management Practice
BOG	Boil Off Gas
Bscfd	Billion standard cubic feet per day
CAA	Clean Air Act
CCR	Central Control Room
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CIAA	Cumulative Impact Assessment Area
CO_2	Carbon Dioxide
Commission	Federal Energy Regulatory Commission
CPCN	Certificate of Public Convenience and Necessity
CWA	Clean Water Act
DOE	United States Department of Energy
EI	Environmental Inspector
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
EPCC	Engineering, Procurement, Construction and Commissioning
ESA	Endangered Species Act
ESD	Emergency Shutdown System
^{o}F	Degrees Fahrenheit
FERC	Federal Energy Regulatory Commission
FSP	Facility Security Plan
GLO	Texas General Land Office
gpm	Gallons per minute

H_2S	Hydrogen sulfide
Hg	Mercury
HIPPS	High Integrity Pressure Protection System
HVAC	Heating, Ventilation and Air Conditioning
ICF	ICF International
km	Kilometer
LLC	Limited Liability Corporation
LNG	Liquefied Natural Gas
LNVA	Lower Neches Valley Authority
L.P.	Limited Partnership
m^3	Cubic meter
MA	Maintenance area
MLLW	Mean lower low water
MMBtu	Million British thermal units
MMscfd	Million standard cubic feet per day
MP	Milepost
MOF	Material Offloading Facility
MR	Mixed refrigerants
MTPA	Million tonnes per annum
MW	Megawatts
NAA	Nonattainment area
NAAQS	National Ambient Air Quality Standards
NAVD'88	North American Vertical Datum of 1988
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NGA	Natural Gas Act
NGL	Natural Gas Liquids
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOx	Nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NSA	Noise sensitive area

NSR	New Source Review
OCIMF	Oil Companies International Marine Forum
%	Percent
PALNG	Port Arthur LNG, LLC
PAPL	Port Arthur Pipeline, LLC
PCB	Polychlorinated biphenyls
PHMSA	Pipeline Hazardous Materials Safety Administration
Plan	Upland Erosion Control, Revegetation and Maintenance Plan (2013)
PM2.5	Fine particulate matter [with a diameter of 2.5 microns or less]
ppmv	Parts per million by volume
Procedures	Wetland and Waterbody Construction and Mitigation Procedures (2013)
Project	Port Arthur Liquefaction Project
PSD	Prevention of Significant Deterioration
psig	Pounds per square inch gauge
Q1	First Quarter of the Year (January through March)
Q2	Second Quarter of the year (April through June)
Q3	Third Quarter of the Year (July through September)
Q4	Fourth Quarter of the Year (October through December)
RRC	Railroad Commission of Texas
RO	Reverse Osmosis
ROW	Right of Way
RR	Resource Report
S.B. Bar	Sabine Bar Buoy
SH	State Highway
SIGTTO	Society of International Gas Tanker and Terminal Operators
TCEQ	Texas Commission of Environmental Quality
THC	Texas Historical Commission
TPWD	Texas Parks and Wildlife Department
TWC	Texas Workforce Commission
TXDOT	Texas Department of Transportation
U.S.	United States
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard

USFWS	United States Fish and Wildlife Service
USGP	Sempra US Gas & Power
USGS	United States Geological Survey
UV/IR	Ultraviolet/Infrared
VOC	Volatile organic compounds
yd^3	Cubic yards

DRAFT RESOURCE REPORT 1
GENERAL PROJECT DESCRIPTION

1.0 INTRODUCTION

In support of its application, Port Arthur LNG, LLC (PALNG), an affiliate of Sempra LNG and Midstream, has prepared Resource Reports 1 through 13, in compliance with the requirements of the Federal Energy Regulatory Commission's (FERC's or Commission's) regulations for authorization to site, construct, and operate natural gas liquefaction facilities and a liquefied natural gas (LNG) export terminal under Section 3 (a) of the Natural Gas Act (NGA). Port Arthur Pipeline, LLC (PAPL), an affiliate of Sempra US Gas & Power (USGP), is filing a complementary application in compliance with Section 7(c) that will address the feed gas supply pipeline to the Port Arthur Liquefaction Project (Project).

PALNG proposes to use approximately 890 acres of the approximately 2,900 acres of property owned by its affiliate Port Arthur LNG Holdings, LLC to site, construct, and operate the Project. The Project site is located west of State Highway (SH) 87, south of the City of Port Arthur, Texas, south of the Gulf Intracoastal Waterway and along the western side of the Port Arthur Canal, which is part of the Sabine-Neches Waterway system. A figure depicting the location of the proposed Project facilities is provided as Figure 1.1-1.

Natural gas will be delivered to the Project through the proposed new pipeline facilities being developed by PAPL. Liquefaction trains will cool the natural gas into a cryogenic liquid form and then stored in full-containment LNG storage tanks with a capacity of 160,000 cubic meters (m^3) each. The proposed nominal train capacity of the liquefaction process will be approximately 12.0 million tonnes per annum (MTPA) or 6.0 MTPA per train. A marine facility capable of berthing LNG vessels will be constructed to transfer LNG onto ships for export to foreign markets.

The LNG Facility site is approximately 5 miles south of the City of Port Arthur and 6 miles to the north of the community of Sabine Pass, Texas. The LNG Facility site falls partially within the jurisdictional boundary limits of the City of Port Arthur and entirely within the jurisdictional boundary of Jefferson County, Texas. The site is well separated from residential areas and areas of public activity.

In 2006, the Commission issued to PALNG (formerly Port Arthur LNG, L.P.) authorization under (Docket No. CP05-83-000) Section 3 of the NGA to construct and operate an LNG import facility at the same site proposed for the currently proposed LNG export terminal. That authorization provided PALNG the right to construct and operate facilities necessary to receive, store, and re-gasify LNG, and send out natural gas from the LNG terminal for delivery to domestic markets. As established by the Commission, the initial maximum send-out rate for the LNG terminal was to be 1.5 billion standard cubic feet per day (Bscfd) for Phase 1 and 3.0 Bscfd for Phase 2. Due to changing market conditions, this permitted facility was never built.

The Project will provide economic benefits to the area through temporary jobs during construction, as well as permanent jobs during the operation of the facility. Procurement of local goods and services during both the construction and operational phases of the Project will also provide additional economic benefits, as will the new industries that will develop as an indirect result of the construction and operation of the LNG export facility. The community of Sabine Pass and the Texas Department of Transportation (TXDOT) will also benefit from the relocation of a high-

maintenance portion of SH 87 that is subject to erosion from wave action from passing vessels and flooding during storms. This portion of SH 87 will be relocated to the western border of the Project, resulting in a more reliable evacuation route for the community of Sabine Pass and reducing ongoing maintenance costs for TXDOT. PALNG, in a cooperative effort with the Texas Parks and Wildlife Department (TPWD), have discussed the beneficial use of dredge material for the restoration of marshlands within the J.D. Murphree Wildlife Management Area. PALNG sold a portion of its land holdings north of Keith Lake to Jefferson County for the construction of a public boat ramp/parking area that includes access to Keith Lake and the J.D. Murphree Wildlife Management Area.

Information supplied in these resource reports will be available for FERC's preparation of an Environmental Impact Statement (EIS) under a third-party contractor agreement with PALNG as the Applicant and FERC as the lead agency for the National Environmental Policy Act (NEPA) process. On March 20, 2015, the Applicant requested approval to participate in FERC's NEPA Pre-Filing Process to foster stakeholder involvement; to allow for the early identification and resolution of environmental issues; and to provide input into the development of the Applicants' environmental resource reports. FERC granted PALNG's request on March 31, 2015, and assigned Pre-Filing Docket Number PF15-18-000. Section 1.8 of this Resource Report 1 provides a description of the public outreach and consultation activities that have been conducted to date as part of the pre-filing process. Discussions and correspondence with agencies are included in Appendix 1A.

This Resource Report 1 generally describes the Project as well as the purpose and need for the Project from both national and regional perspectives. It also describes benefits to the local Project area, land requirements, construction and operation procedures, non-jurisdictional facilities, and applicable regulatory approvals and coordination. Resource Reports 2 through 9 more specifically describe the existing environment by resource, the potential impacts associated with the construction and operation of the Project, and the proposed measures to mitigate these impacts. Resource Report 10 describes the alternatives considered for the siting of the Project. Resource Report 11 contains a description of the design, construction, operation, and maintenance measures incorporated into the Project to minimize potential hazards to the public from unforeseen failures of the Project facilities as a result of accidents or natural catastrophes. Resource Report 12, pertaining to polychlorinated biphenyls (PCB), is not applicable to the Project because there is no PCB contamination of facilities to be removed, replaced, or abandoned and therefore not included with this application. Resource Report 13 provides a detailed description of engineering and design related to the Project. Each resource report includes a compliance table showing how the Commission's minimum filing requirements (18 Code of Federal Regulations [CFR], Part 380.12) have been met.

The resource reports are consistent with and meet all of the requirements of the Commission. Commission approval and issuance of authorization for construction of the Project by the fourth quarter (Q4) of 2017 will be needed to allow for the startup of the first liquefaction train in mid-2023 and the second liquefaction train by the end of 2023.

1.1 PROJECT DESCRIPTION

1.1.1 Purpose and Need

The proposed natural gas processing and liquefaction facilities that will be constructed as part of the Project will enable PALNG to receive and liquefy domestic natural gas for export to foreign markets. PALNG identified a set of objectives to be fulfilled by the PALNG project. Those objectives include:

- The Project will provide a stable and economically priced supply of domestically-sourced LNG to foreign markets, thereby helping the U.S. balance of trade;
- The Project will provide a reliable and timely source of LNG using proven onshore liquefaction technology that can safely produce large quantities of LNG;
- The Project will have access to multiple interstate and intrastate pipelines and storage systems, providing it with a competitive source of pipeline-quality natural gas as feedstock;
- The Project will be developed at a site that will have a minimal net environmental and community impact;
- The Project site will have nearby access to existing safety and security infrastructure, such as the United States Coast Guard, and local fire and police;
- The Project will have ready access to a deep water channel, enabling LNG carriers to safely traverse to and from the Gulf of Mexico;
- The Project will have access to both major roads and barge traffic to enable delivery of large equipment during construction;

In addition to satisfying the above objectives, there is a demonstrated market demand and need for the Project. Presently, the United States has a substantial and sustainable surplus of natural gas reserves and productive capacity. Within the past several years, natural gas drilling productivity gains and technology enhancements has resulted in rapid growth in supplies.[1] In light of these substantial resource additions and the comparatively minor increases in domestic natural gas demand, there are more than sufficient natural gas resources to accommodate both domestic demand and the natural gas exports proposed in connection with the Project.[2] As United States natural gas resources and production have increased, United States natural gas prices have fallen significantly.[3] Prices for natural gas in the United States are now substantially below those of most other major gas-consuming countries. The result is that domestic gas can be liquefied and exported to foreign markets on a very competitive basis.

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[1] In its Annual Energy Outlook 2015, the Energy Information Administration of the DOE noted that United States shale gas production continued to increase in the most recent annual period. The Energy Information Administration expects this increase in gas production to continue through 2035. *See 2015 Annual Energy Outlook (2014).*

[2] DOE, Energy Information Administration, Annual Energy Outlook 2015 (2015), Table 9.2.

[3] The annual average Henry Hub price for natural gas fell from $8.69 per million British thermal units (MMBtu) in 2005 to $2.62 in 2015. DOE, *Energy Information Administration, Natural Gas Spot and Futures Prices*, available at http://www.eia.gov/dnav/ng/hist/rngwhhda.htm

PALNG is discussing various contractual arrangements with multiple parties. Initial discussions with these parties demonstrate the high level of market interest in the Project and the attractive economics for potential Project customers. The expected nominal capacity of each liquefaction train will be up to 6.0 MTPA, which is equivalent to approximately 700 million standard cubic feet per day (MMscfd) of natural gas or 256 billion cubic feet of natural gas per annum. The actual capacity of each train will be confirmed through performance testing upon completion of construction.

In addition to satisfying the market demand for liquefaction and export of domestic natural gas, the Project offers other public benefits. These benefits include substantial positive impacts on the national, regional, and local economies, improvement in the United States balance of trade, and significant reductions in global emissions of greenhouse gases.

The design and construction of the Project are expected to create a peak of approximately 3,500 onsite jobs during the third year of construction and approximately 1,300 jobs averaged over the 60-month period of the Project (including 12 months of engineering and 48 months of construction). Many more offsite jobs will be created to support construction activities. PALNG estimates that a total economy-wide impact of approximately 126,400 (ICF International, p. 47) job years will be created over the 48-month construction period. The total economic impact resulting from the Project is estimated to be $222 billion (ICF International, p. 50).

In addition to the positive impacts of construction, the Project will result in a substantial improvement in the United States balance of trade. While the Project alone will not eliminate this imbalance, it will make a significant contribution to reducing the trade imbalance for a sustained period of time. In connection with its application to the U.S. Department of Energy for authorization to export LNG to non-free trade agreement countries, PALNG commissioned the independent consulting firm ICF International (ICF) to evaluate the economic impacts of the Project. The ICF report, which is dated June 5, 2015, is entitled “Economic Impacts of the Port Arthur Liquefaction Project: Information for DOE non-FTA Permit Application”. Among the impacts that ICF evaluated is the extent to which the Project will impact the United States balance of trade. According to ICF, the Project will generate an expected cumulative value of approximately $110.3 billion of LNG exports over the 20-year export term, which will have a materially favorable impact on the balance of trade that the United States has with its international trading partners. This value equates to an annual impact of $4.8 billion over the 20-year export term. (ICF International, p. 51)

Additionally, the Project will be consistent with President Obama’s National Export Initiative, declared by Executive Order 13534 of March 11, 2010.

Finally, the Project will significantly enhance the anticipated reductions in global emissions of greenhouse gases that are expected to result from the export of LNG from the United States to foreign markets, by providing consuming nations with access to lower carbon dioxide (CO_2)-emitting natural gas as an alternative to higher CO_2-emitting fossil fuels such as coal and fuel oil. For example, an LNG supply of 1 Bscfd has the potential to replace almost 6,400 megawatts (MW) of traditional coal-fired generation. This decrease will result in a reduction in combustion emissions of CO_2 of approximately 126,000 tons of CO_2 per day.

1.1.2 General Project Facilities

The PALNG Liquefaction Facility will be located on property owned by an affiliate of PALNG along SH 87 south of Port Arthur, Texas, and north of Sabine Pass, Texas, on the western side of the Port Arthur Canal (Figure 1.1-1).

Once the Project facilities are completed and placed in service, natural gas will be delivered to the Project via a new 42-inch diameter pipeline. This pipeline is comprised of one northern segment measuring approximately 28 miles long and a second 42-inch diameter segment, measuring approximately 7 miles long. The northern segment will connect with the Florida Gas Transmission Pipeline system, the Texas Eastern Transmission Company Pipeline system and the Houston Pipeline System near Vidor, Texas. The southern pipeline segment will connect with the Natural Gas Pipe Line of America facilities to the south of the proposed terminal in Jefferson County, Texas and Kinder Morgan Louisiana Pipeline in Calcasieu Parish, Louisiana. This new pipeline and related facilities will be addressed in a separate application filed by PAPL pursuant to Section 7(c) of the NGA. Once received at the Project, the natural gas will be liquefied and stored in full-containment storage tanks awaiting loading onto LNG carriers for export.

The proposed Project facilities will have a nominal capacity of 12.0 MTPA. The Project will have three full-containment LNG storage tanks. These LNG storage tanks will store the proposed production of the natural gas liquefaction facilities. The new facilities will be utilized to transfer LNG from the LNG storage tanks onto LNG vessels. LNG vessels will be loaded at the rate of up to 12,000 m^3 per hour.

The berthing area will be designed to accept LNG vessels up to the Q-Max size, i.e., roughly 266,000 m^3; however, the carrying capacity of the most likely LNG carriers will range from about 138,000 m^3 to 205,000 m^3. Both the frequency and number of LNG vessels calling at the terminal will vary depending on the size of the vessels calling at the Project. The average-sized carrier can be expected to remain berthed at the dock for about a day (i.e., 6 hours for pre-loading activities, plus 14 hours of loading, plus 5 hours of post-loading activities).

The incoming LNG vessels' local transit route will typically begin at the pilot boarding area located in the Gulf of Mexico, approximately 30 miles offshore. From here, the vessels will travel through Sabine Pass, heading towards Sabine Lake, before entering the Port Arthur Canal segment of the Sabine-Neches Waterway. Transit to the Project's marine berths, located at approximate milepost (MP) 14 of the Port Arthur Canal, will be facilitated by a turning basin in the Port Arthur Canal of 1,700 feet diameter, adjacent to the terminal. Vessels will return to sea by reversing their travel. The Applicable navigation charts are National Oceanic and Atmospheric Administration (NOAA) 11332, 11341 (approach), and 11342 (inward passage).

On September 11, 2015, the United States Coast Guard (USCG) issued to the Commission its Letter of Recommendation conveying its opinion as to the suitability of the Sabine Neches Ship Channel for LNG marine traffic. The USCG recommended that "the Sabine Neches River Ship Channel be considered suitable for accommodating the type and frequency of LNG marine traffic associated with this project."

The following facilities will be constructed as part of the Project:

- Two liquefaction trains, each with a nominal capacity of up to 6.0 MTPA, each with its own gas treatment facilities;
- Condensate and refrigerant storage areas;
- A marine facility, including up to two LNG berths, with two LNG loading arms and two hybrid arms;
- Condensate loading and refrigerant unloading truck facilities;
- A construction and materials loading/unloading dock; and
- Three 160,000 m^3 full-containment LNG storage tanks.
- The capability of self-generation of the electrical power required for the liquefaction project by utilizing nine (9) combustion turbine generators.

All facilities and components will be constructed in accordance with governing Federal and State regulations, including 33 CFR Part 127 for the marine facilities, 49 CFR Part 193, and National Fire Protection Association (NFPA) Standard 59A for LNG facilities and the codes and standards referenced therein.

The Project Site Map depicting the areal extent of the proposed facilities is provided as Figure 1.1-2. The Site Plan showing the layout of the Project facilities is provided as Figure 1.1-3.

1.1.2.1 Liquefaction Trains

The liquefaction facilities will consist of two liquefaction trains, each comprised of a feed gas pre-treatment unit, a heavy hydrocarbon removal unit, and liquefaction unit.

1.1.2.1.1 Feed Gas Pre-Treatment Facilities

The feed gas for the liquefaction trains will be pipeline quality natural gas. Even though the quality of this gas meets interstate pipeline gas specifications, small amounts of impurities will need to be removed prior to liquefaction. The feed gas pre-treatment facilities include the following:

- Inlet Gas Conditioning - The inlet gas conditioning facilities will consist of an inlet gas coalescer (to remove particulates and liquids), metering, an inlet gas pre-heater, a pressure control valve station, and a set of High Integrity Pressure Protection System (HIPPS) valves.
- Mercury Removal Unit - Mercury (Hg) is naturally occurring in natural gas. If not removed, Hg would condense during the LNG cooling process and collect at low points in the process equipment, forming an amalgamate with aluminum. To ensure this formation does not occur, Hg will be removed in a Mercury Removal Unit. This unit will utilize a sulfur-impregnated metal oxide adsorbent, which converts elemental Hg to mercuric sulfide. This material is stable and will not release Hg under normal conditions. Spent adsorbent will be placed in containers and transported via truck to a recycler for reprocessing and recovery of the Hg.
- Hydrogen Sulfide (H_2S) Removal Unit - The H_2S in the feed gas will be absorbed in an H_2S scavenger bed. H_2S is removed using a solid absorbent which results in a stable waste material disposed of in a non-hazardous landfill. The solid absorbent is contained in two scavenger beds, operating in parallel, in lead-lag configuration per liquefaction train. As the

absorbent is used up, individual vessels are isolated, and the absorbent is emptied and recharged while the rest of the unit remains on-line. Absorbent bed service life is approximately 1 year. The quantity of spent adsorbent during each replacement is expected to be approximately 140 tons per train, or a total of approximately 280 tons for both trains. Spent absorbent will be placed in containers and transported via truck to a processing facility.

- Amine Unit - CO_2 concentrations greater than 50 ppmv will freeze in the LNG processing facilities. CO_2 will be removed in the Amine Unit, which uses amine (50% Methyl-diethanolamine/piperazine in water) as an absorbent. The amine solution absorbs the CO_2 and is then regenerated. The regenerator overhead stream contains the CO_2 which is routed to a thermal oxidizer. A purge stream of the amine absorbent containing amine degradation products will also be generated. This stream will be periodically withdrawn from the Amine Unit and sent offsite for reprocessing.
- Dehydration Unit - At low temperatures water vapor in the gas stream will freeze and plug the heat exchanger tubes. Water vapor will be removed from the feed gas in a Dehydration Unit using molecular sieve beds. These beds are regenerated and the water vapor is condensed and recovered. This water will be utilized as make-up water for the Amine Unit or treated and discharged.

1.1.2.1.2 Heavy Hydrocarbon Removal Unit

The heavy hydrocarbons (pentanes and longer chain hydrocarbons) are removed upstream of the liquefaction process. These constituents are removed to prevent freezing and plugging of the main cryogenic heat exchanger. This unit includes heat exchangers and a turbo expander to condense natural gas liquids from the feed gas stream and then uses a deethanizer and debutanizer to produce a stabilized condensate product which is stored, sold, and transported offsite for disposition to third parties. The lighter natural gas liquids from the deethanizer overhead stream are re-injected back into the gas stream prior to liquefaction. No intermediate storage is required for these streams.

1.1.2.1.3 Liquefaction Unit

The feed gas is condensed in the liquefaction process. Feed gas is contacted with progressively cooler refrigerants. At each stage of the process the gas becomes cooler until it is totally condensed. The refrigerants employed to cool the natural gas are propane and mixed refrigerant (MR). The MR is composed of nitrogen and a mixture of light hydrocarbons. The propane refrigerant is used to pre-cool the feed gas, and the MR is used to achieve the liquefaction temperature. The Project expects to utilize a liquefaction process designed and optimized by Air Products and Chemicals Inc. (APCI).

1.1.2.2 LNG Storage Tanks

Three full-containment LNG storage tanks with a design capacity of 160,000 m^3 each, designed to maintain LNG at a temperature of -260 degrees Fahrenheit (°F) and a normal pressure of 1 to 4 pounds per square inch gauge (psig), will be constructed as part of the Project. The LNG storage tanks will have a primary 9% nickel steel inner container and a secondary pre-stressed concrete outer container wall, a reinforced concrete outer container bottom, a reinforced concrete domed roof, and an aluminum insulated support deck suspended from the outer container roof

over the inner container. The tanks are designed and will be constructed so that both the primary container and the secondary container are capable of independently containing the stored LNG. The primary container will hold the cryogenic liquid under normal operating conditions. The secondary container is capable of containing the cryogenic liquid and of controlling vapor resulting from product release from the inner container. The outside diameter of the outer container will be approximately 256 feet, and the height of the top of the dome will be approximately 176 feet above grade. The tanks will be built on piles. The LNG tank pile caps will be elevated with approximately 6 feet of clearance space between the final grade and the bottom of the pile cap. A diagram showing a typical design for an LNG storage tank is provided in Figure 1.1-4.

1.1.2.3 Marine Facilities

The Project will include the construction of two LNG vessel loading berths and a turning basin.

1.1.2.3.1 LNG Berth

The marine facilities will be capable of loading approximately one LNG vessel a day. The actual number of LNG vessels anticipated to call on the terminal will be dependent on commercial requirements set forth in the commercial offtake arrangements to be negotiated for the Project, the size of the LNG vessels calling on the terminal over time, and any limitations set by the USCG for the waterway. The typical number of carriers per year is expected to be approximately 180 vessels, or 3 to 4 carriers per week.

The LNG ship berth will be approximately 1,350 feet in width and 1,900 feet in length and dredged to a nominal depth of -45 feet mean lower low water (MLLW) to allow both Q-Flex and Q-Max size vessels adequate clearance. A turning basin with an approximate diameter of 1,700 feet will be included as part of the slip.

A total of four loading arms will be installed on each loading platform, two for loading LNG to the LNG tankers and two hybrid arms capable of loading LNG to the ship or returning vapor to the terminal storage tanks.

The facilities have been designed to provide safe berths for the receipt and support of LNG ships and to ensure the safe transfer of LNG cargo from onshore storage facilities to the ships.

1.1.2.3.2 Dredged Material Disposal Areas

Construction of the marine facilities will require the dredging of approximately 7.2 million cubic yards (yd^3) of materials.

A plan for the disposition of approximately 2.4 million yd^3 of the dredge material (beneficial reuse on public lands) is currently being developed as part of the Wetland Mitigation Plan . The Wetland Mitigation Plan will be provided with the formal application filing and discussed in detail in Resource Report 2, Water Quality. Alternative options for disposal of the remaining 4.8 million yd^3 are being investigated and include using the material onsite to establish project grade and/or construction of the berm.

1.1.2.4 Refrigerant Make-up and Condensate Product Storage

1.1.2.4.1 Refrigerant Make-up Storage

Refrigerants required for the liquefaction process will be unloaded from trucks and stored onsite for initial filling and use, as needed, for make-up. Refrigerants will include propane (American Society of Heating, Refrigerating, & Air-Conditioning Engineers [ASHRAE] R-290) and ethane (ASHRAE R-170). Make-up storage will be common to both of the liquefaction trains. Both propane and ethane are anticipated to be self-generated except for the initial startup requirements.

Liquid propane will be stored onsite in bullet storage tanks and supplied to the propane and the MR refrigeration systems of the two trains as required for make-up.. An additional two storage bullets of the same size will be installed and maintained empty and available for de-inventorying one train in the event of a shutdown. Additional information about this system is included in Resource Report 13.

For ethane refrigerant make-up, liquid ethane will be stored in one vacuum-insulated jacketed/double-wall pressurized storage bullet and will be supplied to the MR compressor as necessary. A dedicated refrigerant system will be included in the design to maintain the temperature in the storage bullet and minimize ethane losses. Additional information about this system is included in Resource Report 13.

1.1.2.4.2 Condensate Product Storage

Stabilized condensate product from the Heavy Hydrocarbon Removal Unit will be stored in two low-pressure (API-620) storage tanks with a total design capacity of 845,000 gallons. The storage tanks will be maintained at a pressure slightly above atmospheric pressure to minimize losses and will be vented to a control device (thermal oxidizer). Stabilized condensate will be produced continuously. The average production rate will require approximately five tanker trucks per day to remove the condensate from the site. Additional information about this system is included in Resource Report 13.

1.1.2.5 Truck Loading/Unloading Facility

The truck loading/unloading facility will serve to unload make-up refrigerant brought to the site and will also load condensate product stored onsite for delivery into the marketplace.

The potential routes of these trucks to and from the Project will be via SH 87 from the north or from the south.

1.1.2.6 Material Offloading Facility

A material off-loading facility (MOF) will be constructed along the western shore of the Port Arthur Canal and north of the LNG Facility (Figure 1.1.3). The MOF will utilize existing concreted docks and off-loading areas that were constructed when the property was used for seafood management to the extent possible. Additional restoration and construction will be required to bring the site up to support barge traffic and ultimately serve as a LNG vessel tug mooring site

1.1.2.7 Combustion Turbine Generators

Electric power will be generated on-site using nine (9) gas turbine driven generators with a total capacity of approximately 240 MW total. The primary voltage will be 13.8 kV, with secondary voltages of 4,160 V and 480 V as required.

1.1.2.8 Liquefaction Facility Utilities/Systems

The major auxiliary systems required for the operation of the liquefaction facility, i.e., boil-off gas (BOG), fuel gas, hot oil, flares, instrument and utility air supply, water supply, demineralized water, nitrogen, and backup power, are described in the paragraphs that follow.

1.1.2.8.1 BOG System

BOG is generated due to heat influx into the LNG storage tanks, associated piping and also from the LNG vessels during loading operations. This BOG will be routed to three BOG compressors (two 50% units plus one spare). The BOG will be compressed and sent to the fuel gas system with excess BOG being recycled back to the front end of the liquefaction process.

1.1.2.8.2 Fuel Gas System

Fuel gas for equipment within the liquefaction trains, e.g., refrigeration compressor gas turbines, will be provided primarily from the flash gas generated from various sources within the liquefaction process, and will be augmented with BOG and gas from the natural gas pipelines. The fuel gas will be compressed up to the pressure required for the gas turbines driving various compressors within the liquefaction process.

1.1.2.8.3 Hot Oil System

Hot oil is required for feed gas heating, molecular sieve regeneration, amine regeneration, and deethanizer and debutanizer reboilers. Low-temperature hot oil services will be provided for the amine reboiler, and high-temperature hot oil will be provided for all other services.

1.1.2.8.4 Flares

There are two proposed flare systems, including a Ground Flare and a Marine Flare. The Ground Flare will handle the vent gases from the process areas of the Liquefaction operations, while the Marine Flare will control vent gases associated with the LNG storage, LNG storage tanks and LNG ship vapor return from the loading and the ship cool down operation.

The proposed flares are shown on the overall site plan provided as Figure 1.1-3.

1.1.2.8.5 Instrument and Utility Air Supply

Utility compressed air will be used throughout the facility to power the tools and used in the operation and maintenance of the Project. Dry instrument air will be used for the instrumentation and control systems at the facility. Additional information on this system is provided in Resource Report 13.

1.1.2.8.6 Water Supply

The water supply to the facility will be potable water obtained from the local municipal system. An existing 16-inch water main traverses along SH 87 and will be relocated to the west of the site during the highway and utility relocation (Section 1.2.2). The potable water will be used for various utilities such as firewater, hose stations, and in the terminal buildings' lavatories. Five emergency fire water pumps (675 kW) will have the capacity to withdraw water from the nearby Port Arthur Canal.

1.1.2.8.7 Demineralized Water

During normal operation, the amine unit requires water to make up for water losses to the feed gas stream. Water recovered from inlet gas dehydration and demineralized water is used to provide this makeup water, which is approximately 4.9 gpm per train on average with a maximum rate of 20 gpm. A demineralized water system will be installed to provide make-up water for two trains. To produce this quantity of demineralized water, approximately 100 gpm of water is required for processing in a reverse osmosis (RO) unit to remove dissolved solids from the water. This water will be supplied to the RO unit from the utility water system. The treated water exiting the RO unit will be further processed in an electro-ionization unit to produce the demineralized water.

1.1.2.8.8 Nitrogen

Liquid nitrogen vaporizers will be used to supply gaseous nitrogen for various uses in the plant. The nitrogen required for pre-commissioning and Project start-up, which includes providing inert gas to the tanks, drying out and cool down activities, will be provided by additional temporary facilities, e.g., mobile liquid nitrogen pumping units.

1.1.2.8.9 Backup Power

Three 3.375 MW diesel engine driven stand-by generators will provide emergency backup power for critical uses such as instrument air, emergency lighting, and heating, ventilation, and air conditioning (HVAC) for control systems. The generators will be provided diesel from a diesel storage tank. The diesel storage tank will be contained within a concrete containment capable of holding 110% of the contents of the diesel tank.

1.2 LAND REQUIREMENTS

The Project will include property for the production, storage, and loading of LNG onto ships for export. The plant facilities will occupy a portion of the approximate 2,900-acre property owned by the PALNG affiliate. In an effort to minimize the overall impact acreage, the Project footprint only will require approximately 890 acres for construction and operations of Project facilities (Table 1.2-1). The Project areas are shown in Figure 1.2-1. All construction laydown areas have been minimized and will be located within the permanent footprint of the facility.

1.3 CONSTRUCTION PROCEDURES AND SCHEDULE

The Project will be constructed in accordance with applicable governmental regulations, permits, and approvals and industry recognized construction methods. A summary of the construction

methods are provided below. More detailed descriptions of construction methods will be prepared in construction specifications and drawings prior to the commencement of work. Construction will be performed in accordance with PALNG's Environmental Plan (Appendix 1B). The Environmental Plan includes as appendices:

- Appendix 1B1 – Spill Notification and Agency Contacts
- Appendix 1B2 – Unanticipated Hazardous Waste Discovery Plan
- Appendix 1B3 – Unanticipated Discovery Plan
- Appendix 1B4 – PALNG Upland Erosion Control, Revegetation, and Maintenance Plan (PALNG Plan)
- Appendix 1B5 – PALNG Wetland and Waterbody Construction and Mitigation Procedures (PALNG Procedures)

PALNG will generally conform with FERC's Upland Erosion Control, Revegetation, and Maintenance Plan (Plan) and their Wetland and Waterbody Construction and Mitigation Procedures (Procedures), modified to reflect that the Project will be built on a reclaimed dredge spoil site that currently supports wetlands. PALNG will utilize Best Management Practices (BMPs) as discussed in the Environmental Plan (Appendix 1B) and will include a standard set of BMPs with construction drawings to be implemented and maintained by the contractor. The PALNG Plan and PALNG Procedures are further discussed in Resource Reports 2.

1.3.1 Site Construction Overview

Detailed workforce data can be found in Resource Report 5, Socioeconomics. It is estimated that a peak labor force of approximately 3,500 onsite personnel will be required. Monthly projections for workforce, local expenditures, payroll, and material deliveries are provided in Appendix 1E.

Following the issuance of the FERC authorization to construct (ATC), general site preparations will begin with clearing and grubbing. Two liquefaction trains are to be constructed, each with approximately 6 month's lag between projected completion dates. Project construction will begin soon after all regulatory permits and approvals have been received. Construction work for the liquefaction and related support facilities will be performed in the following sequence, to the extent practicable:

- Site preparation;
- Piling;
- Underground services (deepest first);
- Duct banks;
- Foundations;
- Pipe rack erection;
- Cable tray rack erection;
- Structural steel erection;
- Piping fabrication and erection;

- Equipment installation;
- Electrical installation;
- Instrument insulation;
- Painting and insulation;
- Tie-ins;
- Mechanical completion;
- System handover;
- Loop checks;
- Pre-Commissioning
- Commissioning and Start-up.

The work activities described above are not intended to be either complete or in strict sequence of operation but only as a guide to the overall planning/scheduling operations. The construction methods to be adopted are not expected to vary from industry norms used in the Gulf States Region.

The Engineering, Procurement, Construction and Commissioning (EPCC) contractor will determine the extent of modularization on the project. This will be done early in the detailed design. There are several module types that can be used:

- Pre-Assembled Units – Multi-disciplined modules including: tagged and non-tagged items, steel, piping, electrical, instrumentation, fireproofing and insulation;
- Pre-Assembled Racks – Piping modules including: steel, piping, electrical cable tray, fireproofing and insulation;
- Vendor Assembled Units – Pre-assembled units assembled by a vendor;
- Vendor Package Units – Complete packages purchased from a vendor; and
- Remote Instrument Buildings, Substations, etc.

Regardless of the extent of modularization, a majority of the construction procedures in this document will not change; some of the activities might be shifted offsite to an existing fabrication shop or modularization yard.

Any work that will be performed onsite requires some form of temporary facilities ranging from craft break rooms, office space, roads, parking, and laydown areas. These temporary facilities will be located on the property secured for the Project and include those facilities identified below. If any resource is required outside of the existing project property, it will be identified and constructed only after receiving the necessary permits and authorizations.

- Material laydown areas;
- Site office facilities;
- Subcontractor office facilities;

- Construction power;
- Parking;
- Orientation facility;
- Medical facility;
- Craft lunch / change tent;
- Heavy haul routes; and
- Barge unloading.

Major equipment required for construction of the LNG facility will include cranes ranging in size from 30-ton to 250-ton capacity, bull dozers, excavators, loaders, compactors, multiple portable welding units, scaffolding, equipment trailers and nondestructive test equipment.

1.3.2 Site Preparation

Geotechnical studies were previously completed for the PALNG import and regasification project, and additional focused studies have been undertaken as needed. The prior studies determined the soil properties of the existing subsurface materials and identified the design criteria for ground improvements and foundations. Based on the results of those studies and the additional focused studies, the foundations for settlement-sensitive equipment and structures such as the LNG storage tanks, process equipment, and pipe racks, should be supported by concrete piles. Foundations will be constructed on top of the piles. The elevation of the top of concrete of foundations of all critical process equipment and structures will be installed at plus six feet above mean sea level.

Construction site preparation will require clearing and filling of the site to an approximate elevation of plus six feet for the LNG storage tank area and for the process areas. Following clearing and grading of the site, areas of weak soils will be over excavated and filled with structural fill. The underground pipe and electrical trenching will be placed in accordance with the drawings and specifications to a depth providing a minimum 3 feet of cover below finish grade. Temporary ditches, sediment fences, and sediment traps will be installed as necessary. Individual excavations will be made for equipment foundations. All settlement sensitive equipment, buildings, and structures will be supported on piles. Piles will be installed to a depth of approximately 160 feet for the LNG storage tanks and to a depth of approximately 70-80 feet for the remaining foundations. Following completion of foundations, the site will be filled, compacted, and brought up to final grade. Final grading and landscape will consist of gravel-surfaced areas, asphalt-surfaced areas, concrete-paved surfaces, and grass areas.

1.3.3 Foundations and Pipe Racks

The techniques used to construct the foundations for the associated structures will be based on the soil-bearing capacity of the site as described in the geotechnical report. Critical equipment and structures such as process equipment and pipe racks will have their foundations supported by piles; smaller foundations may be comprised of spread footings. Foundations will be constructed of reinforced concrete and designed according to standard engineering practices.

Foundations for all process equipment and large machinery will typically be completed and cured before equipment arrival onsite to allow immediate setting of the equipment. This approach reduces the need for temporary storage, extra movement and lifting, all of which increases the risk of needing additional storage area, damage to the equipment, and/or schedule delays.

As the pipe rack foundations advance and the concrete is cured, assembly and erection of the structural steel pipe rack, or modules, will commence. As the pipe racks or modules are completed, work will commence on erecting straight run piping and cable trays, depending on which way the EPCC contactor chooses to proceed with their construction execution.

1.3.4 Piping

Typically, pipe is pre-fabricated in segments (spools), which allow complicated pipe segments to be completed more easily. Piping will be fabricated and installed according to American Society of Mechanical Engineers (ASME) standards. Installation will conform to the final design plans and specifications. Welders will be qualified according to ASME Section IX. For LNG and other cryogenic pipe services, the use of flanges or other potential leak sources will be minimized in the design.

Shortly after process equipment is set, rough aligned, and secured to its foundation, pipe attachment will begin. If the pipe is pre-fabricated, the final closure welds will not be completed until the equipment is set, to prevent pipe connection misalignment.

Long lengths of pipe that are installed on a pipe rack and/or structural supports often are installed “in position”. The pipe is laid on the pipe rack, after which temporary support rolls are installed so that the pipe lengths can be “rolled” during jointing or welding. When the jointing work on the long pipe rack lengths is completed, the temporary support rolls are removed.

The pipe and mechanical installation work is expected to be performed at many locations within the liquefaction trains at the same time. Scheduling of the pipe work in an area is often determined by the deliveries of the major process equipment as well as the pipe spool delivery. In most cases utility piping will be the first completed, so that no start-up activities are hindered.

Mechanical, electrical and instrumentation work will be concurrent with or closely follow pipe erection. Following the completion of pipe testing, backfilling of underground pipe and pipe painting of aboveground pipe (as needed), insulation will be installed on aboveground pipe concurrent with electrical and instrument installation.

1.3.5 Pressure Testing

Hydrostatic or pneumatic testing of the pipe is conducted as soon as a pipe system is completed, valves and/or flanges are attached, non-destructive testing is completed, and the system completion walk down is performed and cleared. The piping at the site will be hydrostatically or pneumatically tested in compliance with the applicable codes that govern the pipe design. In general, cryogenic piping will be pneumatically tested and non-cryogenic piping will be hydrotested using clean water. Hydrotest water will be obtained from a municipal source. Hydrotest water will be filtered and discharged in accordance with applicable State and Federal permits. Testing will be in accordance with ASME standards.

1.3.6 Materials and Equipment Delivery

Materials and equipment will be shipped from the place of origin. Final transportation to the site will be undertaken by road transport or by marine (barge or vessel) delivery to the Materials Offloading Facility (MOF as described below). PALNG further envisions some bulk materials, such as insulations, will be shipped in standardized containers. Fabrication shops will be used to fabricate pipe spool pieces and other prefabricated units of equipment and skid mounted process equipment modules with delivery to the site in accordance with the construction schedule. Prefabricated, skid-mounted equipment will be utilized to minimize the number of pieces that must be erected at the site.

Bulk materials and equipment are anticipated to be delivered to the Project using the MOF. Concrete is expected to be produced at an onsite concrete batch plant.

The onsite MOF will be constructed using conventional landside and marine construction methods. The anticipated volume of dredge material is approximately 67,600 yd^3. The planned areas for placement of the dredge material will be permitted for placement of the dredge spoil from the MOF.

The anticipated construction methods and sequence will be as follows:

- Install the steel sheet pile cutoff wall approximately 60 feet behind the front face of the MOF structure;
- Complete soil improvements involving shallow soil mixing from approximately existing Elevation +6 feet NAVD'88 to Elevation -14 feet NAVD'88 (20 feet deep) along the length of the proposed MOF and extending back from the bulkhead approximately 50 feet. The soil improvements will use the dry soil mixing process to increase the shear strength of the in-situ soils;
- Drive battered steel pipe piles on the water side of the steel sheet piles and install a concrete bent cap to provide anchorage to the bulkhead;
- Perform the necessary earthwork (cut/fill) to provide a working surface at approximately Elevation +13 feet NAVD'88 (±).
- Dredge all material (including any temporary fill) on waterside of the bulkhead;
- Install mooring hardware along the front face of the working platform;
- Install fender system on the front face of the working platform;
- Place select structural fill (gravel) from the existing grade at approximately EL +6 feet NAVD'88 to EL +13 feet NAVD'88 behind the bulkhead to provide a working surface that is continuous with the pile supported working platform;
- Install utilities and appurtenances.

1.3.7 Mechanical

After the equipment is set on its foundation, it will be leveled and shimmed before securing the anchor bolts, with grouting being installed after alignment or when required by the equipment manufacturer. Final cold alignment of rotating equipment will be performed after the final

attachment of the pipe and supporting attachments are installed. After final alignment, pre-commissioning will begin with lubricant filling, initial electrical loop checks, and energizing for motor directional rotation.

1.3.8 Systems Painting and Corrosion Protection

Carbon steel piping will be delivered to either the jobsite or subcontractor for sandblasting and priming prior to erection onsite. Vendor-supplied equipment, including piping located on prefabricated skid building or equipment will use manufacturer's standard coating systems. The equipment to be located outside will have a coating system that is compatible with the Project coating system and system identification coloring.

1.3.9 Buildings

Pipe and plumbing work inside of the buildings will be included as part of the building construction, or will be scheduled for installation concurrent with the building interior work.

1.3.10 Pre-Commissioning

As the process, mechanical, electrical, and instrumentation work is completed, pre-commissioning activities will begin. These activities include:

- Systematic discipline conformity checks on each part or item of equipment to ensure that the items have been installed in accordance with the drawings, specifications, suppliers' instructions, safety rules, codes, standards and accepted practice.
- Static de-energized tests of specific equipment to assure the completeness and quality of critical components. This work will cover activities such as machinery alignment, instrument calibration, pressure testing of piping, cable testing for continuity and isolation, and safety device settings.
- Flushing and cleaning of piping and equipment.
- Nitrogen leak testing of all hydrocarbon piping and associated equipment.

Instruments will be calibrated before loop checks of the electrical and instrumentation circuits are completed. When the pre-commissioning activities are completed, the systems piping will be cleaned. .

1.3.11 Roads

Final, finished road work is typically the last item to be completed. This work will be scheduled after the heavy equipment (cranes, heavy haul trucks, etc.) have completed their work, so as to avoid and minimize damage to the roadways by heavy equipment. Most roadways will be paved.

1.3.12 LNG Storage Tanks

The description below provides a brief outline of the construction procedures for the LNG storage tanks. Some offsite fabrication may occur depending on the tank vendor. For example, some LNG tank erectors will have some offsite fabrication, such as sections of the inner plate and the

steel, and will have these items delivered by barge or truck. Large items, such as piles, may be delivered by barge.

1.3.12.1 LNG Storage Tank Foundations

The construction of the full containment LNG storage tanks below the top of the elevated pile cap foundation consists of the following activities:

- Removal of top layer of soil – The depth of the soil to be removed is a function of the spacing of the driven piles. The closer the spacing, the less soil must be removed;
- Treatment of the surface layer of the soil by soil replacement or other methods (soil stabilization) suitable to the site conditions;
- Driving piles to an approximate depth of 160 feet. (The final pile set is to be confirmed by the pile driving analysis);
- Treatment of the pile heads to resist design bending moment;
- Installation of binding concrete for the concrete pile cap;
- Installation of the formwork for the pile cap;
- Installation of reinforcement steel;
- Installation of vertical pre-stressing sheath, settlement monitoring system, anchor strap assemblies; and
- Pouring of foundation concrete.

1.3.12.2 LNG Storage Tanks Above the Base Slab

The construction of the full-containment LNG storage tanks above the top of the elevated pile cap foundation consists of the following activities:

- Construction of the post-tensioned outer concrete container wall will follow the completion of the tank bottom. Temporary construction openings will be constructed during the initial concrete lifts. Rebar and embeds will be installed. Insert straps of 9% nickel and carbon steel will be cast into the concrete wall for the attachment of the wall liner plates, thermal corner protection, along with external support embedment for piping, stairways, and other connections and structures. The concrete for the pre-stressed concrete wall will then be poured.
- A temporary access opening will be built into the outer-concreted container wall to permit future access into the outer container and to permit construction of the inner container.
- The bottom carbon steel vapor liner will then be installed.
- During the construction of the outer concrete container wall, construction of the steel dome roof and suspended deck will be undertaken on temporary supports inside of the outer container. The suspended deck and dome roof will be raised into final position during the air raising operation.
- At the top of the outer concrete container wall, the steel dome roof compression ring will be cast into the concrete.

- Tendons will be installed in some of the ducts, and then the wall will be partially post-tensioned prior to the roof air raising procedure.
- On completion of the upper concrete ring beam, the steel dome roof will be air raised into position and secured to the embedded compression ring. Construction openings will be temporarily closed during the roof air raise operation.
- The pre-stress cable installation will be completed and tensioned, and the ducts will be grouted.
- After securing the dome roof to the compression ring, installation of all roof nozzles, penetrations and studs plus steel reinforcement and concrete covering of the steel dome roof will be undertaken. Concurrent with this activity, work will commence on the inner container, initiated with installation of lights, air circulation, and ventilation equipment. The roof slab will be constructed in two or three layers. Each layer will consist of circumferential rings varying in width and poured to progress simultaneously on opposite sides of the dome. The temporary construction opening(s) will again be closed, and the tank will be pressurized to provide internal vapor pressure support of the roof during placement of the first concrete layer. The internal pressure is maintained until all of the first layer concrete pours are completed and the concrete has cured sufficiently to be self-supporting.
- The concrete plinths will be constructed to receive the roof platform steelwork, etc.
- Internal work will include the installation of vapor barriers to the inside face of the concrete container, placement of concrete leveling screeds, base insulation, and sand layers, etc. Insulation will be extended up the inside face of the outer concrete container vapor barrier to a height of approximately 15 feet to provide thermal protection to the bottom corner of the concrete wall to base slab.
- Installation of the 9% nickel steel “secondary bottom” and bottom corner protection will be completed.
- A concrete upper leveling course screed will be placed on top of the 9% nickel steel secondary bottom.
- Installation of the 9% nickel steel inner container annular and bottom plates will be undertaken on completion of the upper leveling course screed.
- After installation of the inner container annular plates, work will commence on erection of the inner tank shell with provision for a temporary opening into the inner container at the same location as the outer tank opening.
- The tank internal accessories such as pump columns, bottom and top fill, instrument wells, and purge and cool-down piping will be installed. Roof platforms, walkways, and piping will be installed. The construction opening door sheet in the inner container will be installed and closed. Hydrotesting of the tank will follow.
- External attachments such as structural, platform, and pipe support installation will be completed.
- After completion of the tank internal piping, the temporary opening in the outer tank wall will again be closed. The inner tank will be filled with water to the required hydrostatic test height. Settlement monitoring will be conducted throughout the period of water filling, testing and emptying. The external tank will be pneumatically tested per API 620 procedures.

Closing of the outer concrete container opening will be required prior to the outer tank pneumatic test being undertaken.

- Process piping from tank top to grade will be installed.
- Following a successful inner container hydrotest, the tank will be washed down and cleaned. The resilient blanket will then be installed on the outside of the inner tank shell, followed by finalizing installation of the instrumentation inside of the tank and annular space. The temporary construction opening will then be closed permanently. Installation of insulation systems will commence. Installation of the perlite requires that the tank be completely dry.
- The tank insulation systems will be completed. Perlite insulation will be expanded and installed using vibration into the tank annular space. The suspended deck blanket insulation will be installed along with completion of external piping insulation.
- After completion of all insulation system installations, the tank will be visually inspected and cleaned. LNG pumps will then be installed; the tank will be closed and purged with nitrogen to a positive gauge pressure.

At this point in the construction process, the tank will be ready for purge and cool-down.

1.3.12.3 Testing

All testing will be conducted in accordance with applicable city, State and Federal codes and requirements. The following indicate some of the tests:

Hydrotesting

The inner container of the LNG storage tanks will be hydraulically tested (hydrotested) in accordance with the requirements of API 620. The hydrotest water will be non-saline surface water anticipated to be purchased from the Lower Neches Valley Authority (LNVA) and transported to the terminal in barges. The water will be pumped from the extraction point to the barges using either electrically or engine driven pumps suitably sized to achieve the required transfer rate. Floating suction hoses with strainers attached will be deployed to avoid entrainment or impingement of organisms and to prevent drawing in unnecessary solids and silts from the riverbed. Alternatively, hydrostatic test water will be obtained from onsite ground water wells.

In advance of filling the tanks, the hydrotest water source will be tested to ensure that the water will meet all applicable code requirements. Due to non-overlapping construction schedules, the three tanks will be hydrotested independently with new water being procured for each hydrotesting effort. Water will be introduced into the inner tank container through a manhole in the outer container concrete roof at a rate that will not exceed the limitations specified in API 620. The duration that the water remains in the tanks will be strictly controlled and generally held less than 2 weeks. Therefore, it is not expected that any contamination or discoloration will be present on discharge. All discharges of hydrotest water will be done in compliance with appropriate permit conditions.

The quantity of water required for hydrotesting one tank is estimated to be approximately 29 million gallons. Therefore, the total required volume of hydrotest water is estimated to be 87 million gallons. The total duration of each hydrotest, from start of filling to emptying, is expected to be approximately 3 weeks.

On completion of hydrotesting, the water will be pumped from inside of each inner tank using electrically driven submersible pumps suitably sized for the required lift height out of the tank, as there are no bottom or side outlets on the LNG tanks. The specific discharge point of the hydrotest water will be dependent upon the ongoing construction activity on the LNG Facility site at the time of discharge. However, due consideration will be taken to environmental impact of discharged water. If necessary, a number of discharge points can be accommodated to dissipate the test water over a large area. The final routing of pipework for discharging the hydrotest water will be developed during the construction of the tanks.

The rate of discharge is expected to be approximately 1,800,000 gallons per 24 hours for the bulk pumping operation with substantially lower rates being achieved when removing the final amounts of water from the tank bottoms. The hydrotest water will be discharged into the Port Arthur Canal through a purpose-built velocity control structure. Water will be sampled and tested for suitability in accordance with discharge permit conditions. If treatment is found to be required, treatment procedures will be developed prior to discharge.

Pneumatic Testing

A pneumatic test of the LNG storage tank outer container will be performed in accordance with API 620. The outer container will be held at 1.25 times the design pressure for 1 hour.

Testing of Pipework

Piping will be tested using hydrostatic or pneumatic methods. In general, cryogenic piping will be pneumatically tested with dry air or nitrogen at 1.1 times design pressure. Non-cryogenic piping will be hydrotested using clean water at 1.5 times design pressure. Testing will be performed in accordance with the ASME standards.

1.3.13 Restoration

Areas disturbed by construction of the Project facilities will be stabilized with temporary erosion controls until construction is complete unless covered by equipment, gravel or other covering. Following construction, all areas of the Project site affected by the construction will be permanently stabilized, for example, with gravel, concrete, or paved surfaces, see Appendices 1B4 and 1B5. Restoration will not occur for areas impacted by construction since they will be subsequently used during operation.

1.3.14 Marine Facilities

The construction of the marine facilities will be accomplished using both conventional landside construction equipment as well as marine equipment. A barge-mounted hydraulic dredging spread and dual marine construction spreads each comprising crane and supply barges with tug boat support. The crane barges will likely carry 80-ton and 140-ton capacity cranes, pile drivers, welding, cutting and grinding machines, sand blasting and painting equipment.

Construction of the marine facilities will be initiated with mobilization of conventional land earthwork equipment followed by a hydraulic dredge spread. Material to be dredged from the Dredge LNG Berth Basin (5.8 million yd^3) and the turning basin (1.4 million yd^3) in the Port Arthur Canal consists of approximately 7.2 million yd^3 of material.

Once dredging operations have progressed to the extent that the marine construction spreads can be mobilized, installation of the first berth will begin. Two marine construction spreads will be utilized to start driving the piles for the different structures. Once the superstructure work is able to commence (pile caps, beams, etc.) one of the marine construction spreads will be utilized to support this work. Upon completion of the first berth's structures, the second berth's structures will be installed in a similar manner.

Once the dredging of the berth is completed, dredging required to accommodate vessel maneuvering in the Port Arthur Canal will be carried out. In order to provide safe LNG ship maneuvering operations for the proposed facility, a 1,700-foot-diameter turning basin will be created. This turning basin will be dredged to a nominal -45 feet MLLW depth with side slopes at 3:1. The top of the dredged slope will be a minimum of 80 feet from the restored shoreline. Once all dredging is complete, the dredging spread will be demobilized.

The specific construction sequences for the marine berth are summarized as follows:

- Complete soil improvements involving shallow soil mixing from approximately existing Elevation +3 feet NAVD'88 to Elevation -5 feet NAVD'88 (8 feet deep) along the length of the proposed Dredged LNG Berth Basin. The location of the soil improvements will be from the anchored steel sheet pile bulkhead extending landward approximately 100 feet. The soil improvements will use the dry soil mixing process to increase the shear strength of the in-situ soils;

- Install steel sheet piles along the perimeter of the Dredged LNG Berth Basin;

- Install bulkhead tie-rods, steel channel wales and continuous concrete anchor deadman to anchor bulkhead;

- Dredge all material on waterside of the bulkhead starting at the proposed North Berth and proceeding to the South Berth;

- Install steel pipe piling for the loading platform, approach trestle, mooring and breasting dolphins;

- Loading Platform and Access Trestle Installation:

  - Install rip rap slope protection from the front face of the loading platform to the bulkhead;

  - Install concrete pile bent caps and precast concrete panels with topping slab for the loading platform;

  - Install concrete pile bent caps and precast concrete box beams with topping slab for the approach trestle;

  - Install gangway, marine loading arms, piping, and ancillary equipment;

- Mooring Dolphins and Breasting Dolphins Installation:

  - Install cast-in-place reinforced concrete pile cap for the mooring dolphins and breasting dolphins;
  - Install quick release hooks
  - Install fender system on breasting dolphins
  - Install handrails

- Install rip rap slope protection from the front face of the anchored bulkhead to the dredge toe line;
- Install walkways
- Place structural fill from the bulkhead to the footprint of the earthen levee with a crest at approximately EL +20.6 feet NAVD'88;
- Install rip rap slope protection from the bulkhead to the crest of the earthen levee
- Commission

Installation of both loading berths will require approximately 22 months. The overall duration of dredging and installation of both berths will require approximately 38 months.

1.3.15 Shoreline Protection

Shoreline protection has been an ongoing concern for the Port Arthur Canal. TXDOT has installed shoreline protection along the western shoreline of Pleasure Island, which helps to address the erosion issue on the eastern side of the Port Arthur Canal, including the area across from the PALNG Facility site. The relocation of SH 87, as part of the Project, will alleviate concern for erosion of SH 87 in the area of the LNG Facility site. Following the relocation of SH 87, PALNG will stabilize non-structural areas of the shoreline with a rock rip rap revetment to prevent further erosion from occurring.

1.3.16 Schedule

To meet the anticipated in-service date of mid-2023, construction activities for the LNG Facility are expected to begin in Q1 2018. Construction of the LNG storage tanks is expected to take up to 36 months as shown on the specific schedule for the major project construction activities.

The general Project schedule is provided below:

- Submit Request to Initiate Pre-Filing Review Process – March 2015,
- File NGA Section 3 Application – September 2016,
- Issuance by the Commission of the NEPA Document – Anticipated second quarter 2017,
- Issuance of Section 3 Authorization – Anticipated fourth quarter 2017,
- Initiate Construction of Project – Anticipated first quarter 2018,
- Commence Operations (first train) – Anticipated mid-2023, and

- Commence Operations (second train) – Anticipated fourth quarter 2023.

1.3.17 Environmental Compliance

PALNG will prepare an Implementation Plan following the issuance of the Order by the Commission. This Implementation Plan will detail how PALNG will comply with each of the conditions attached to the Order. PALNG will have a full-time Environmental Inspector (EI) dedicated to ensuring the construction activities at the Project site are conducted in compliance with all permits, Environmental Plan requirements, and conditions of the FERC Order. The EI will ensure that all construction personnel receive environmental training before they are allowed on the construction site. A permit book and compliance table will be prepared to assist the EI in achieving compliance. The permit book will have copies of all permits and permit conditions will be summarized in a compliance table for quick reference. The EI will have stop work authority. The EI will prepare the Project compliance reports and will be responsible for ensuring that any non-compliance is corrected in a timely and satisfactory manner.

1.4 OPERATION AND MAINTENANCE PROCEDURES

The Project facilities will have an Operations and Maintenance Manual that identifies the operating and maintenance procedures for the Project. Prior to commissioning activities, all operations and maintenance personnel for the proposed facilities will be trained to properly and safely perform their jobs. Operators will be trained in the potential hazards associated with the liquefaction process and the proper operations and maintenance of all equipment. The operators will meet all the training requirements of the USCG, US Department of Transportation, local fire departments, and other regulatory entities. Operations staffing is estimated at 220 employees.

An onsite Central Control Room (CCR) will be located inside of the facility close to the marine terminal and the administrative building to monitor and control the operation of the facility. In addition to the CCR, there will be additional control rooms close to the two jetties to monitor the ship loading operations.

1.5 SAFETY CONTROLS

The Project facilities will be designed, constructed, operated, and maintained in accordance with the Pipeline Hazardous Materials Safety Administration (PHMSA) Federal Safety Standards for Liquefied Natural Gas Facilities, 49 CFR Part 193. The facilities will also meet the NFPA 59A LNG Standards. Safety controls and the role they play are addressed in more detail in Resource Report 11.

1.5.1 Spill Containment

The LNG and refrigerant spill containment systems for the Project will be designed and constructed to comply with 49 CFR Part 193 and NFPA 59A. These regulations require that each LNG container and each LNG transfer system be provided with a means of secondary containment which has been sized to hold the quantity of LNG that could be released as a result of the design spill which is appropriate for the area and LNG equipment. The regulations also require transfer and storage areas for flammable refrigerants and flammable liquids be graded, drained, or provided with impoundment in a manner that minimizes the possibility of accidental spills and leaks that could endanger important structures, equipment, or adjoining property or that

could reach waterways. The Project design includes containment for potential spills and impoundments for both the process area and refrigerant storage area (Figure 1.1-3).

1.5.2 Thermal Exclusion and Vapor Dispersion Zones

Thermal radiation and vapor dispersion exclusion zones will be calculated for the proposed project facilities as required by 49 CFR Part 193.2057(a) using the models approved by PHMSA and the Commission. In these calculations, the weather conditions from the area that produced the furthest exclusion distance will be utilized as required in 49 CFR Part 193.2057(b). The facility will be designed to comply with siting criteria in 49 CFR Part 193.2057.

1.5.3 Hazard Detection System

Hazard detectors for the Project will be installed throughout the facilities to give operations personnel a means for early detection and location of released flammable gases and fires. The Project will use a design philosophy for hazard detection as is typically used throughout the industry. For example, hazard detection systems will consist of the following:

- Combustible gas detection;
- Fire and flame detection;
- Fiber optic leak detection;
- High temperature detection;
- Low temperature detection; and
- Smoke detectors.

The hazard detection systems will be hard wired to the main control system for alarm. Area gas detectors will be provided to monitor flammable gases. Low temperature sensors will be located at the spill impoundment basins to shut down and/or prevent the storm water pumps from starting in the event of an LNG spill. Ultraviolet/infrared (UV/IR) fire and flame detectors will also be located throughout the facility and high temperature detectors will be located to detect a fire on the vent pipes of the LNG storage tank relief valves.

1.5.4 Hazard Control System

Several different types of fire suppression agents will be available for fighting fires within the Project facilities. The type of agent that will be used in a specific situation will depend on the characteristics of a particular event and on the relative effectiveness of the various agents on that particular type of fire. Hazard control systems will consist of the following:

- Firewater system;
- High expansion foam system;
- Sprinkler, water spray and deluge systems;
- Portable and wheeled fire extinguishers;
- Fail safe shutdown system; and

- Security system.

1.5.4.1 Firewater System

The Project will be provided with firewater supply and distribution systems for extinguishing fires, cooling structures and equipment exposed to thermal radiation, and dispersing flammable vapors. Hydrants, hose reels, and fixed monitors will be strategically located for the Project. This new system will include a water storage tank that will be supplied by the facility water supply as noted under "Water Supply" in Section 1.1.2.7. This storage tank will provide a 2-hour water supply for the firewater system. Channel water pumps will provide a back-up water supply from the Port Arthur Canal in the event additional water is required.

1.5.4.2 High Expansion Foam System

High expansion foam concentrate will be metered or proportioned into the firewater system by means of a typical balanced pressure foam proportioning system. The resulting foam solution will be delivered via underground piping to the high expansion foam generator installed on the berm of the LNG spill impoundment sump. The high expansion foam generator, ANGUS or equivalent, will be water motor powered, thus no electrical power will be required. This foam is applied to LNG spills, whether ignited or un-ignited. Applied to ignited spills, the foam controls the fire, greatly reducing the level of radiant heat to the surroundings. High expansion foam systems will be in accordance with NFPA 11A.

1.5.4.3 Fail Safe Shutdown System

The Project facilities will have an emergency shutdown (ESD) system with shutdown and control devices designed to leave the facilities in a safe state. The ESD system will be used for major incidents and will result in either total plant shutdown, shutdown of processes, and/or individual pieces of equipment, depending on the type of incident.

1.5.4.4 Security System

The PALNG Facility Security Plan (FSP) will be developed for the Project in close coordination with the USCG and PHMSA for the Project. The FSP establishes a written program for physical security for all facilities at the Project. In accordance with PHMSA regulations, the plan provides for risk-based levels of security carried out by trained personnel during all operation shifts and, if necessary, by governmental law enforcement offices to respond to serious threats.

The Project facilities will include sirens that will be audible in all plant locations. The sirens will have a distinctive tone for easy recognition between alarms and emergency events.

1.6 FUTURE PLANS AND ABANDONMENT

There are no facilities to be abandoned as part of this Project. In addition, there are no current plans that will result in the future expansion of Project facilities. The design basis of the Project includes a design life of 30 years, after which time there are several options that could be considered regarding the disposition of the LNG Facility. These options will include: reuse of the facility or selective facility components in the same or alternative service, in-place deactivation or closure that will follow the placement of the facilities in a safe and stable condition with regard to

potential risks to the environment and public safety, or the complete removal of the facilities and restoration of vegetated or affected areas, or some combination.

1.7 PERMITS AND APPROVALS

Construction, operation, and maintenance of the LNG Facility will be in accordance with all applicable Federal, State of Texas, Jefferson County, and City of Port Arthur permits and approvals. Applicable permits and approvals for the LNG Facility are summarized in Table 1.7-1 along with the schedule for filing of all major permits or appropriate documentation. Major permit and approval actions for the LNG Facility involving multiple regulatory agencies will include environmental reviews by the FERC for authorization of the LNG Facility under Section (3) of the NGA, the U.S. Army Corps of Engineers (USACE) for a Section 10/404 Permit, and the Texas General Land Office (GLO) for a coastal zone management consistency determination.

In accordance with Section 402(l)(2) of the Clean Water Act (CWA), the National Pollutant Discharge Elimination System (NPDES) Stormwater General Permit does not apply to the Project. Because the Project is considered an oil and gas production facility, non-contact stormwater runoff from these facilities are exempted. The Project will comply with the PALNG Plan and Procedures as well as other pertinent requirements described in the Environmental Plan with respect to erosion and sediment control.

1.8 AGENCY AND PUBLIC COMMUNICATIONS

PALNG is committed to successful stakeholder communications and an effective public outreach plan on the Project. A listing of the stakeholders and other interested parties is included in Table 1.8-1. These stakeholders have been directly contacted or received written correspondence about the project. General communications with stakeholders are included in Appendix 1A, while resource-specific communications are include in Appendix A in each of the applicable resource reports.

PALNG has developed a public outreach plan that includes the following activities:

- On May 28, 2015, during the early part of the pre-filing process, PALNG held open houses in Port Arthur, Texas, to provide information about the Project to all interested State and Federal agencies, as well as the public.
- PALNG provided support needed for the Commission to conduct a public scoping meeting on July 13, 2015.
- PALNG will continue to identify and hold meetings with local associations, affected public groups, and other non-governmental organizations concerning the Project.
- PALNG will continue to meet with State and local government representatives to seek input, provide updates as the Project progresses, and extend an open invitation to all public meetings.
- PALNG will continue to meet frequently with State and Federal agencies for guidance during permitting and with development of the resource reports. PALNG will respond rapidly to requests for information from permitting agencies and the Commission and will meet with them in person, if that assists in understanding the request and providing the best possible response.

- PALNG has established a publicly available website providing pertinent information about the Project including such items as those listed below. The website has the following address - http://www.portarthurlng.com/ - and includes information on:
  1. Project description and related information;
  2. Project maps and/or images;
  3. Project status;
  4. Project schedule;
  5. Project benefits;
  6. Fact sheets;
  7. The need for the project;
  8. Frequently asked questions; and
  9. Contact information.
- In addition to the website, informational brochures will be available at public libraries to help enable involvement of stakeholders without internet access.
- A single point of contact has been established. The contact is JD Morris, Director, Permitting & Compliance, Sempra LNG & Midstream. Contact information is provided below and included on the Project website.

  JD Morris
  Director, Permitting & Compliance
  Sempra LNG & Midstream
  2925 Briarpark Dr., Suite 900
  Houston, TX 77042
  (713) 298-5479
  E-Mail: jmorris@sempraglobal.com

1.8.1 Agency Contacts

PALNG representatives have completed numerous meetings with agency representatives. Appendix 1A contains a list of these meetings.

1.8.2 Affected Landowners

All of the activities associated with the Project are expected to occur on land currently owned by its affiliate, Port Arthur LNG Holdings, LLC, pursuant to one or more lease agreements or other arrangements to be entered into in connection with the development of the Project. Adjacent landowners, TPWD, TXDOT, and Jefferson County have all been contacted. The names and mailing addresses of landowners within a one-half mile radius of the LNG Facility site are listed in Appendix 1C as Privileged and Confidential.

PALNG plans to implement a grievance and resolution process that would be used during construction, restoration and operation of the project. Property owners, agencies, and the general public will be provided project contact information by letter and other communications means (e.g., email, notice, website) and a toll-free contact phone number and email for the project will

be established. PALNG will establish a protocol for promptly reviewing any grievance and resolving in a timely manner. A record log will be maintained that documents the individual, the type of grievance, responsible department, and resolution.

1.9 FERC NON-JURISDICTIONAL FACILITIES

The Project's marine terminal is water-dependent and must be located along the edge of the Port Arthur Canal. The existing highway, associated utilities, and the adjacent pipeline corridor must be relocated to make way for the proposed liquefaction facilities. There are no other non-jurisdictional facilities associated with the Project.

For the highway/pipeline/utility corridor relocation, PALNG will be responsible for permitting as it impacts the Project lands. The highway, pipelines, and utilities will be relocated in coordination with TXDOT and the respective utility or pipeline owners. Final interconnection of new pipeline and utility segments to the existing facilities will be completed by each respective owner. Unused portions of the relocated pipelines and utilities will be abandoned by their owners per industry standards and State requirements. Operations of all relocated pipelines and utilities will remain with the respective owner.

1.9.1 Non-Jurisdictional Facilities Determination

Under certain circumstances, non-jurisdictional facilities may be subject to FERC's environmental review. In making this determination, FERC requires applicants to address four factors that indicate the need for FERC to do an environmental review of project-related non-jurisdictional facilities. These factors include:

1. Whether or not the regulated activity comprises "merely a link" in a corridor type project (such as a transportation or utility transmission project);
2. Whether there are aspects of the non-jurisdictional facility in the immediate vicinity of the regulated activity which affect the location and configuration of the regulated activity;
3. The extent to which the entire project will be within the FERC's jurisdiction; and
4. The extent of cumulative Federal control and responsibility.

The application of this procedure to the highway/pipeline/utility corridor relocation is as follows:

- With respect to factor 1, while the relocation is a corridor type project, the regulated activity does not comprise any kind of link in a corridor type project. Therefore, this factor does not support a review of the non-jurisdictional facility.
- With respect to factor 2, the relocation does provide access directly to the regulated activity but does not affect the configuration and location of the regulated activity. This factor also does not support a review of the non-jurisdictional facility.
- With respect to factor 3, the relocation is outside of FERC's jurisdiction as the siting, routing, and construction of the relocation is under the jurisdiction of TXDOT and other Texas regulatory agencies. Only the vacated land that the highway and utilities relocation will provide and that is subsequently used for the marine terminal site is within the FERC's jurisdiction. Again, this factor weighs against inclusion of the non-jurisdictional facility in a review by FERC. However, because the relocated facilities will be sited on PALNG lands

previously disturbed by PALNG construction and will be connected to the facilities within the Project that are within the FERC's jurisdiction, PALNG has included nominal information (disturbed area, impacts, mitigation) on this non-jurisdictional facility for an environmental review by FERC.

- With respect to factor 4, the cumulative level of Federal control and responsibility over the project, Federal control is determined by the amount of Federal financing, assistance, direction, regulation, or approval inherent in a project. PALNG is proposing to donate to the State of Texas sufficient funding, property, and services to provide for land acquisition and exchange right-of-way (ROW), utility relocation, environmental assessments, schematic design, engineering, plans, specifications and estimates, construction, and construction phase services necessary to relocate SH 87. TXDOT will oversee all design, engineering, and approvals for the relocation (see Section 1.7). No Federal financing or guarantees will be granted to PALNG, and the non-jurisdictional facilities will be constructed by a private company and then donated to TXDOT. Some Federal permits may be involved, but no Federal lands are involved. TXDOT and other Texas regulatory agencies have substantially all control and responsibility for the relocation and operation of SH 87. Relocating, commissioning, and operating the pipelines and utilities will be done by the companies that own the facilities; there will be no funding Federal funding. Therefore, cumulative Federal control is minimal and this factor does not warrant FERC environmental review.

1.9.2 Highway/Pipeline/Utility Corridor Relocation

While the above factors support PALNG's position that FERC's need not conduct an environmental review in consideration of the NGA Section 3 license, PALNG has included environmental impact information in this and the other resource reports to assist FERC in preparing the EIS as required under the NEPA.

The development of marine facilities providing LNG vessels with ship access to the LNG Facility site will require the relocation of a small portion of SH 87 as well as the existing pipeline and utility corridors that parallel the highway.

The total length of the relocated highway will be 3.6 miles. PALNG will relocate the highway to the western boundary of the Project. No land owned or leased by parties other than affiliates of PALNG will be affected. The narrow portion of land between SH 87 and the Port Arthur Canal is experiencing severe erosion due to wave action from ships in the waterway. TXDOT is in support of this relocation as it will relieve TXDOT of annual expenditures to prevent or minimize the effects of the erosion along the highway. PALNG is proposing to donate to the State of Texas sufficient funding, property, and services to provide for land acquisition and exchange ROW, utility relocation, environmental assessments, schematic design, engineering plans, specifications and estimates, construction, and construction phase services to facilitate this relocation project. TXDOT would have ultimate design approval over the proposed relocation. Applications for the required permits will be submitted and pursued in accordance with applicable TXDOT guidelines. TXDOT would review and inspect all work performed and determine engineering inspection and testing requirements to ensure that the construction of the relocated highway is accomplished in accordance with the plans and specifications approved by TXDOT. Upon completion and acceptance of the relocation project by TXDOT, TXDOT will assume the maintenance responsibilities for the roadway.

In addition to the relocation of SH 87, there are five hydrocarbon pipelines owned by third parties are located adjacent to the current SH 87 that will also have to be relocated or abandoned in connection with the development and construction of the Project. None of these pipelines are under FERC jurisdiction and therefore will not require NGA Section 7(b) review and authorization from FERC. The length of each of these pipelines that would be subject to relocation is approximately 3 miles. These pipelines are to be re-routed to a new corridor collocated with the relocated SH 87 ROW. The pipelines to be relocated or abandoned are listed in Table 1.1-1:

Communications, electrical power distribution, and water lines are also located along the existing SH 87 corridor. These utilities will also be relocated concurrently with SH 87. Refer to Table 1.1-2 for a listing of the subject utilities.

The SH 87/pipeline/utility relocation will follow the existing 100 foot wide transmission line corridor that circumvents the Project site. Approximately 134 acres will be affected by the relocation of the 3.6 miles of the SH 87/pipeline/utility corridor , of which 52 acres will be permanently disturbed by the new road bed (paved lanes and paved shoulders) and 82 acres will be temporarily disturbed by the relocated pipeline/utility corridor. In the southern section of the Project site, the existing Entergy transmission line corridor forms a 100-foot-wide buffer zone between the relocated SH 87 ROW and the TPWD canal that forms the west side of the property owned by PALNG's affiliate.

Relocation of the SH 87/pipeline/utility corridor will require a new ROW of approximately 295 feet. The ROW for the SH 87 will be 120 feet wide including actual paved surface totals of 44 feet, comprised of two 12 feet wide traffic lanes and two ten-feet wide hard shoulders. The remaining 76 feet of the 120-foot-wide ROW includes two 38-foot-wide areas for side slope and drainage. A corridor of approximately 175 feet in width will be used for the relocated pipelines and utilities (Figure 1.9-3).

All construction activities for the road, pipeline, and utilities will occur within the 295-foot-wide ROW along the Entergy transmission line ROW. With exception of the SH 87 road surface and the two adjacent hard shoulders, all other areas within the remaining 120-foot wide corridor will be revegetated following National Resources Conservation Service (NRCS) guidelines for disturbed areas after construction.

The Section 404/10 permit for the project will include the relocation of the highway, pipelines, and power/communication utilities. Applications for the required State and local permits related to the facilities relocation are planned to be submitted in 2016, including permits from TXDOT and the Railroad Commission of Texas (RRC).

1.10 TOPOGRAPHIC MAPS AND AERIAL PHOTOGRAPHY

An original United States Geological Survey (USGS) 7.5-minute series topographic map of the proposed Project site is included as Figure 1.9-1.

An aerial photograph showing the proposed location of the Project facilities is included as Figure 1.9-2.

1.11 CUMULATIVE IMPACTS

Cumulative impacts of the Project have been systematically evaluated and are described in Appendix 1D. The analysis identifies past, present, and reasonably foreseeable future projects that could contribute to a cumulative impact to the environment.

1.12 REFERENCES

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TABLES

Table 1.1-1 Pipelines Affected by the Project

Owner	Facility Type	Dimensions
Centana Intrastate Pipeline, LLC	Intrastate natural gas pipeline	10-inch nominal diameter, 3.3-mile length
Centana Intrastate Pipeline, LLC	Intrastate natural gas pipeline	12-inch nominal diameter, 3.3-mile length
Cameron Highway Oil Pipeline Company	Crude oil pipeline	24-inch nominal diameter, 3.3-mile length
Buckeye Development & Logistics I LLC	Intrastate natural gas pipeline	6-inch nominal diameter, 3.3-mile length
ONEOK Transmission Company (operated by Texas Gas Service Company.	Intrastate natural gas pipeline	8-inch nominal diameter, (pipeline will not be relocated)

Table 1.1-2 Utilities in the Vicinity of the Project

Owner	Facility Type	Dimensions
Entergy Texas, Inc.	Power distribution line Transmission line L-829/830	34.5 kilovolt, 3.3-mile length 230kV double-circuit line adjacent to relocated Hwy 87
City of Port Arthur	Water main line	16inch nominal diameter, 3.3-mile length
AT&T	Communications line	3.3-mile length
Time Warner Cable	Communications line	3.3-mile length

Table 1.2-1 Acres of Project Impacts from Construction and Operation

Component	Impacts		
	Temporary	Permanent	Total
Administration	-	15	15
Infrastructure	-	20	20
Liquefaction and Storage	-	130	130
Marine	-	149	149
Internal Roadway	-	111	111
Utility	-	29	29
Mixed Use	-	411	411
PAPL (Compressor Site)	-	25	25
Totals	**0**	**890**	**890**

Table 1.7-1 Permits, Approvals, Consultations & Regulatory Requirements				
Regulatory Agency	**Permit or Regulatory Approval Required**	**Point of Contact**	**Cooperating / Participating Agency**	**Anticipated Filing Date**
FEDERAL				
Federal Energy Regulatory Commission (FERC)	Certificate of Public Convenience and Necessity (CPCN)	Federal Energy Regulatory Commission 888 First Street, NE Washington, DC 20426 1-866-208-3372		September 2016
U. S. Army Corps of Engineers (USACE)	Clean Water Act (CWA) Section 10/404 Permit	USACE Galveston District Regulatory Field Office 2000 Fort Point Road Galveston, TX 77550 Ms. Janet Botello Mr. Jayson Hudson (409) 766-3982	Yes	September 2016
U.S. Fish and Wildlife Service (USFWS)	Endangered Species Act (ESA) Section 7 Consultation	USFWS Houston Ecological Services Field Office 17629 El Camino Real #211 Houston, TX 77058 Ms. Moni Belton (281) 286-8282	TBD	September 2016
United States Coast Guard (USCG)	Waterway Suitability Assessment	USCG Marine Safety Unit 2901 Turtle Creek Drive, Suite 200 Port Arthur, TX 77642 Captain Randal Ogrydziak, Commanding Officer (409) 723-6500	Yes	Received September 24, 2015
NOAA National Marine Fisheries Service (NMFS)	ESA Section 7 and; Magnuson-Stevens Act Consultation; Essential Fish Habitat	NMFS Conservation Department 4700 Avenue U, Galveston, TX 77551 Ms. Heather Young (409) 766-3500	Yes	September 2016
U. S. Environmental Protection Agency (EPA)	National Pollutant Discharge Elimination System (NPDES) Permit	EPA - Region 6 Water Quality Protection Division 1445 Ross Avenue Dallas, TX 75202-2733 Mr. Issac Chen Ms. Claudia Hosch (214) 665-7515	TBD	Prior to Operations

Table 1.7-1 Permits, Approvals, Consultations & Regulatory Requirements				
Regulatory Agency	**Permit or Regulatory Approval Required**	**Point of Contact**	**Cooperating / Participating Agency**	**Anticipated Filing Date**
U.S. Department of Energy (DOE)	Authorization to Export (Free Trade Agreement Countries)	Ms. Larine A. Moore US Department of Energy PO Box 44375 Washington, DC 20026	Yes	Received August 20, 2015
U.S. Department of Energy (DOE)	Authorization to Export (Non-Free Trade Agreement Countries)	Ms. Larine A. Moore US Department of Energy PO Box 44375 Washington, DC 20026	Yes	Submitted June 15, 2015
STATE				
Texas Commission on Environmental Quality (TCEQ)	Prevention of Significant Deterioration (PSD) Permit New Source Review (NSR) Permit Title V Operating Permit	TCEQ, Air Permits Division P.O. Box 13087 Austin, TX 78711-3087 Ms. Kate Stinchcomb (512) 239-1583.	TBD	Received February 17, 2016
Railroad Commission of Texas (RRC)	401 Certification NPDES Permit – Hydrotest Discharge Permit (if required)	Railroad Commission of Texas 1701 Congress Ave Austin, TX 78701 Ms. Tiffany Humberson (512) 463-6882	TBD	September 2016
Texas Historical Commission (THC)	National Historic Preservation Act Section 106 Consultation	Texas Historical Commission 1511 Colorado Ave. Austin, TX 78701 Mr. Kerry Nichols (512) 463-6508 Mr. Bill Martin (512) 463-5867	Yes	September 2016
Texas General Land Office (GLO)	Statement of Consistency with the Coastal Management Program / Miscellaneous Easement	Texas General Land Office c/o Right-of-Way Dept., PO Box 12873, Austin TX 78711-2873 Mr. Jim Darwin (512) 463-2623	Yes	September 2016

Table 1.7-1 Permits, Approvals, Consultations & Regulatory Requirements				
Regulatory Agency	**Permit or Regulatory Approval Required**	**Point of Contact**	**Cooperating / Participating Agency**	**Anticipated Filing Date**
Texas Department of Transportation (TXDOT)	Road Crossing/ Construction in Right-Of-Way Permit	Texas Department of Transportation 125 East 11th St. Austin, TX 78701 Mr. John P. Campbell, P.E. (512) 463-8588	TBD	January 2017[1]
Texas Parks and Wildlife Department (TPWD)	Consultation with the TPWD for impacts to State protected species and impacts in State Wildlife Management Areas	Texas Parks and Wildlife Department 4200 Smith School Road, Austin, TX 78744 Dr. Michael Rezsutek (409) 736-2551	TBD	May 2015
LOCAL				
Jefferson County	Floodplain Development Permit	Jefferson County Engineering Department 1149 Pearl Street, 5th Floor Beaumont, TX 77701 Mr. Don Rao (409) 835-8584	TBD	January 2017[1]
	Development/ Building Permit	Jefferson County Environmental Control 7933 Viterbo Road, Suite 4 Beaumont, TX 77705 Mr. Michael Melancon (409) 729-5910	TBD	January 2017[1]
City of Port Arthur	Building Permit (if required)	City of Port Arthur 444 4th St. Port Arthur, TX 77640 Mr. Lawrence Baker (409) 983-8500	TBD	January 2017[1]

Notes:

[1] Construction related permits will be submitted approximately six months prior to the anticipated Commission's issuance of a Certificate.

Table 1.8-1

Stakeholder List for the Project

Table 1.8-1 Stakeholder List	
FEDERAL	
The Honorable John Cornyn U.S. Senate 517 Hart Building Washington, DC 20010 (202) 224-2934	The Honorable Ted Cruz U.S. Senate Dirksen Senate Office Bldg Suite 185 Washington, DC 2051 (202) 224-5922
The Honorable Randy Weber U.S. House of Representatives 510 Cannon House Office Building Washington, DC 20515 (202) 225-2831	Heather D. Young National Oceanic and Atmospheric Agency National Marine Fishery Service (NMFS) 4700 Avenue U, Bldg 307 Galveston, Texas 77551 (409) 766-3699
Captain Randal S. Ogrydziak U.S. Coast Guard Marine Safety Office 2901 Turtle Creek Drive, Suite 200 Port Arthur, TX 77642-8056 MSTC Jamie L. Merriman U.S. Coast Guard Facilities Div. Chief MSU Port Arthur (409) 719-5033	Janet Botello U. S. Army Corps of Engineers 2000 Fort Point Blvd Galveston, Texas 77553 (409) 766-3982
U. S. Environmental Protection Agency Region 6 Water Quality Protection Division 1445 Ross Avenue Dallas, TX 75202-2733 (214) 665-7515	Ms. Moni Belton USFWS Houston Ecological Services Field Office 17629 El Camino Real #211 Houston, TX 77058 (281) 286-8282 Mr. Jeff Weller USFWS Louisiana Ecological Services 646 Cajundome Blvd., Suite 400 Lafayette, La. 70506 (337) 291-3100
STATE OF TEXAS	
The Honorable Greg Abbott Governor of Texas Office of Economic Development 221 East 11th Street, Suite 400 Austin, Texas 78701 (512) 936.0240	The Honorable Brandon Creighton State Senator, District 4 P. O. Box 12068 Austin, Texas 78711 (512) 463-0104
The Honorable Robert Nichols State Senator, District 3 P. O. Box 12068 Austin, Texas 78711 (512) 463-0103	The Honorable Dade Phelan State Representative, District 21 P.O. Box 2910 Austin, Texas 78701 (512) 463-0706

The Honorable Joe Deshotel State Representative, District 20 P. O. Box 2910 Austin, Texas 78701 (512) 463-0662	Kate Stinchcomb Texas Commission on Environment Quality 12100 Park 35 Circle, Bldg C Austin, Texas 78753 (512) 239-1583
Tucker Ferguson, P.E. Texas Department of Transportation District Engineer 8350 Eastex Freeway Beaumont, Texas 77708 (409) 898-5731	Jim Darwin Texas General Land Office 6300 Ocean Drive TAMU-CC Natural Resource Center, Ste. 2800, Corpus Christi, TX 78412 (512) 463-2623
Mike Rezsutek Texas Department of Parks and Wildlife 10 Parks and Wildlife Dr Port Arthur Texas 77640 (409) 736-2551	Dale A. Robertson Texas Workforce Commission 101 E. 15th St., Room 154 Austin, TX 78778-0001 (512) 463-6480
Bill Martin Texas Historical Commission 1511 Colorado Ave. Austin, TX 78701 (512) 463-6013	Gaye Greever McElwain Railroad Commission of Texas 1701 Congress Ave Austin, TX 78701 512- 463-6882
Jefferson County, Texas	
The Honorable Jeff Branick Jefferson County Judge P. O. Box 4025 Beaumont, Texas 77704 (409) 835-8469	The Honorable Eddie Arnold Jefferson County Commissioner, PCT 1 1149 Pearl Street, 4th Floor Beaumont, Texas 77701 (409) 835-8442
The Honorable Brent Weaver Jefferson County Commissioner, PCT 2 7759 Viterbo Road Suite #1 Beaumont, Texas 77705 (409) 727-2173	Michael Shane Sinegal Jefferson County Commissioner, PCT 3 525 Lakeshore Drive Port Arthur, Texas 77640 (409) 983-8300
The Honorable Everette “Bo” Allfred Jefferson County Commissioner, PCT 4 1149 Pearl Street Beaumont, Texas 77701 (409) 835-8443	
City of Port Arthur, Texas	
The Honorable Deloris “Bobbie” Prince Mayor 444 4th Street Port Arthur, Texas 77641	Brian McDougal City Manager 444 4th Street Port Arthur, Texas 77641 (409) 983-8101

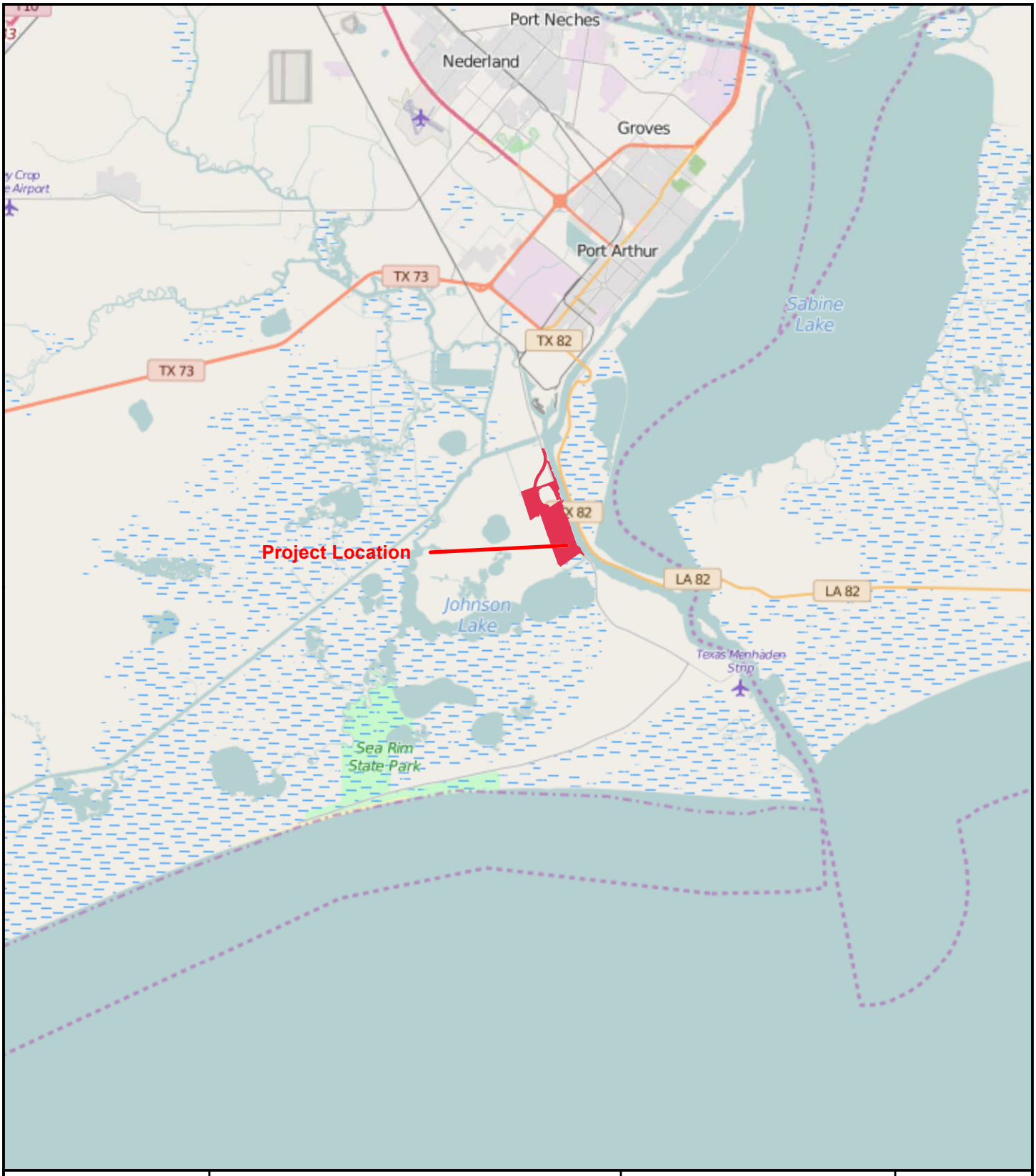
Orange County, Texas	
The Honorable Stephen Brint Carlton Orange County Judge 123 South 6th Street Orange, Texas 77630	
Jefferson County, Texas Local Government Entities	
Orlando Ciramella Port or Port Arthur 221 Houston Avenue Port Arthur, Texas 77641 (409) 983.2011	Sherry Droddy Sabine Pass Port Authority, Manager 5960 South 1st Ave. Sabine Pass, Texas 77655 (409) 971-2411
Randall Reese, Executive Director Sabine-Neches Navigation District 8180 Anchor Drive Port Arthur, Texas 77642 (409) 729.4588	Ellen Warner, Captain Sabine Pilots 5148 West Parkway Street Groves, Texas 77619 (409) 722-3126
Economic Development Organizations	
Bill McCoy Greater Port Arthur Chamber of Commerce 749 North Twin City Highway # 300 Port Arthur, Texas 77642-5839 (409) 963-1107	Regina Lindsey Greater Beaumont Chamber of Commerce 1110 Park Street Beaumont, Texas 77701 (409)838-6581
Bobby Fillyaw Orange County Economic Development Corporation 1201 Childers Road Orange, Texas 77630 (409) 883-7770	Ida Schossow President Greater Orange Area Chamber of Commerce 1012 Green Avenue Orange, Texas 77630 (409) 883-3536

FIGURES

Figure 1.1-1

Project Location Map

Document Path: Y:\Projects\Sempra_LNG\Port_Authur_LNG\Port_Arthur_LNG_Terminal\Maps\FERC\2016_02\PALNG_RR01_111_Location_Map.mxd



Site Location

Legend

Approximate Project Boundary

N
W E
S

Port Arthur Liquefaction Project

Project Location Map

1 inch = 4 miles

0 2 4 Miles

Port Arthur LNG

AECOM

February 2016

FIGURE 1.1-1

Map Projection: NAD83 UTM15N Ft. Sources: Sempra, Open Street Map

Figure 1.1-2

Project Site Map

Site Location

Legend

- Existing Transmission Line
- Proposed State Highway 87
- Project Limits
- Proposed Terminal Facility

N
W E
S

Port Arthur Liquefaction Project

Project Site Map

0 1,500 3,000 Feet

Port Arthur LNG

AECOM

February 2016

FIGURE 1.1-2

Map Projection: NAD83 UTM17N Ft. Sources: Sempra 2016, ESRI 2016

Figure 1.1-3

Site Plan

TPWD Monument
N 13,872,198.13
E 3,568,342.63
Lat 29 47 52.61n
Long 93 57 15.07w

SABINE–NECHES WATERWAY (Ship Channel)
(APPROXIMATE LOCATION)

1700'-0"

COMPRESSOR STATION

KEY AREA LEGEND

1. LIQUEFACTION TRAIN 1
2. LIQUEFACTION TRAIN 2
3. DELETED
4. LNG CARRIER BERTH
5. UTILITY AREA
6. BOG AREA
7. GROUND FLARE
8. Mixed Use
9. Mixed Use
10. MARINE FLARE AREA
11. MATERIAL OFFLOADING FACILITY (MOF)
12. HEAVY HAUL ROAD
13. MAIN BUILDING AREA
    INCLUDES THE FOLLOWING:
    1. MAINTENANCE SHOP AND WAREHOUSE
    2. EMERGENCY RESPONSE EQUIPMENT BUILDING
    3. LABORATORY
    4. GUARD HOUSE
14. DELETED
15. LNG STORAGE TANK #1
16. LNG STORAGE TANK #2
17. LNG STORAGE TANK #3
18. STORM WATER COLLECTION SUMP
19. CONDENSATE STORAGE & TRUCK LOADING
20. REFRIGERANT STORAGE & TRUCK UNLOADING
21. POWER DISTRIBUTION CENTER
22. MAIN CONTROL ROOM
23. ADMINISTRATION BUILDING AND PARKING
24. FRESH WATER / FIREWATER PUMPS AND BASIN
25. LNG IMPOUNDMENT BASIN

(ACRES TOTAL) LEGEND

- DREDGED AREA
- FILL AREA
- TEMPORARY IMPACT AREA
- NO IMPACT AREA

Site Location

N E S W

Port Arthur Liquifaction Project

Site Plan

0 2000 4000 Feet

1 inch = X miles

Port Arthur LNG

AECOM

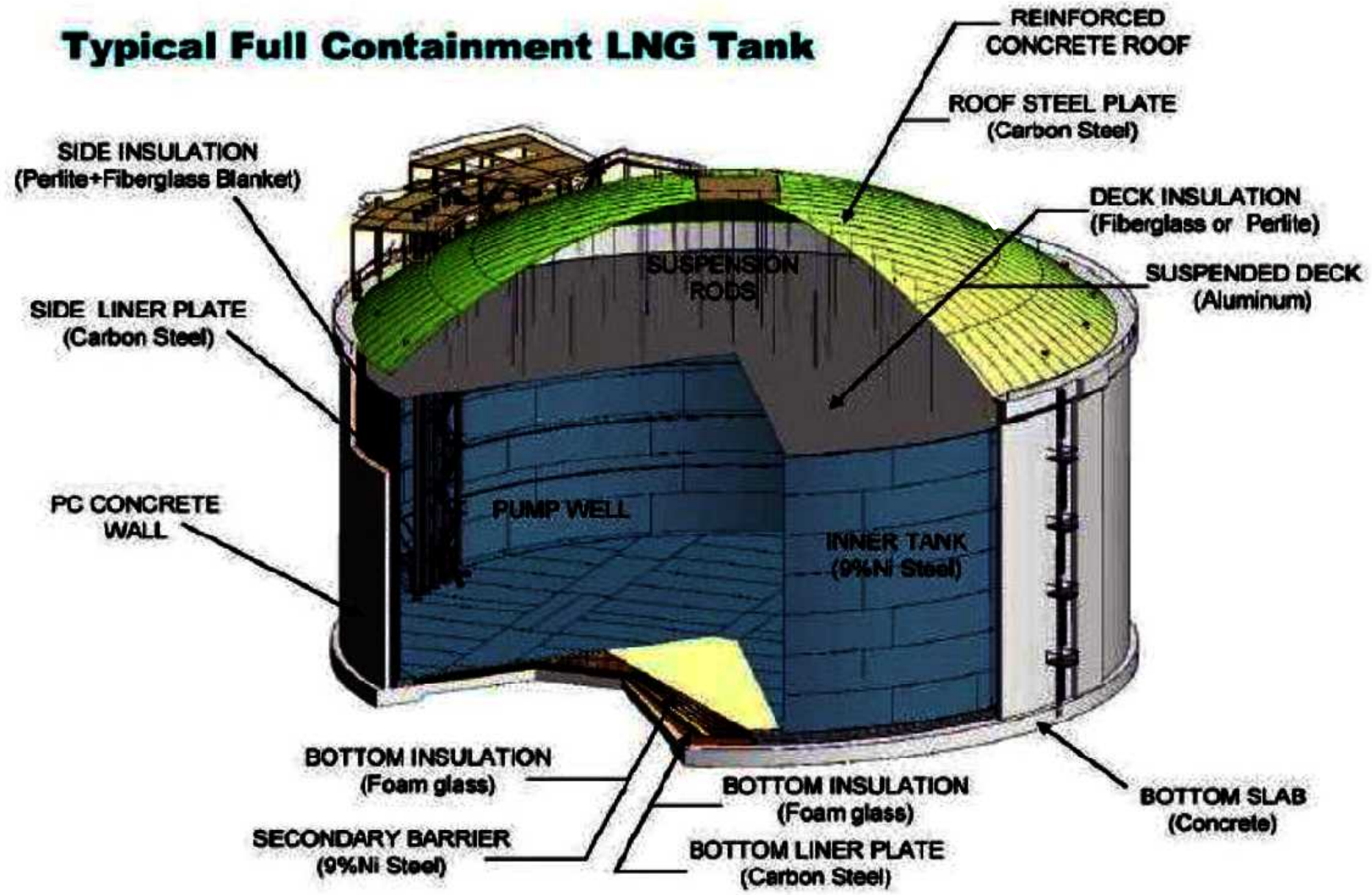
March 2016

Figure 1.1-3

Figure 1.1-4

Conceptual Design of the
LNG Storage Tank

Typical Full Containment LNG Tank



Site Location

Port Arthur Liquefaction Project

Conceptual Design of the LNG Storage Tank

Port Arthur LNG

AECOM

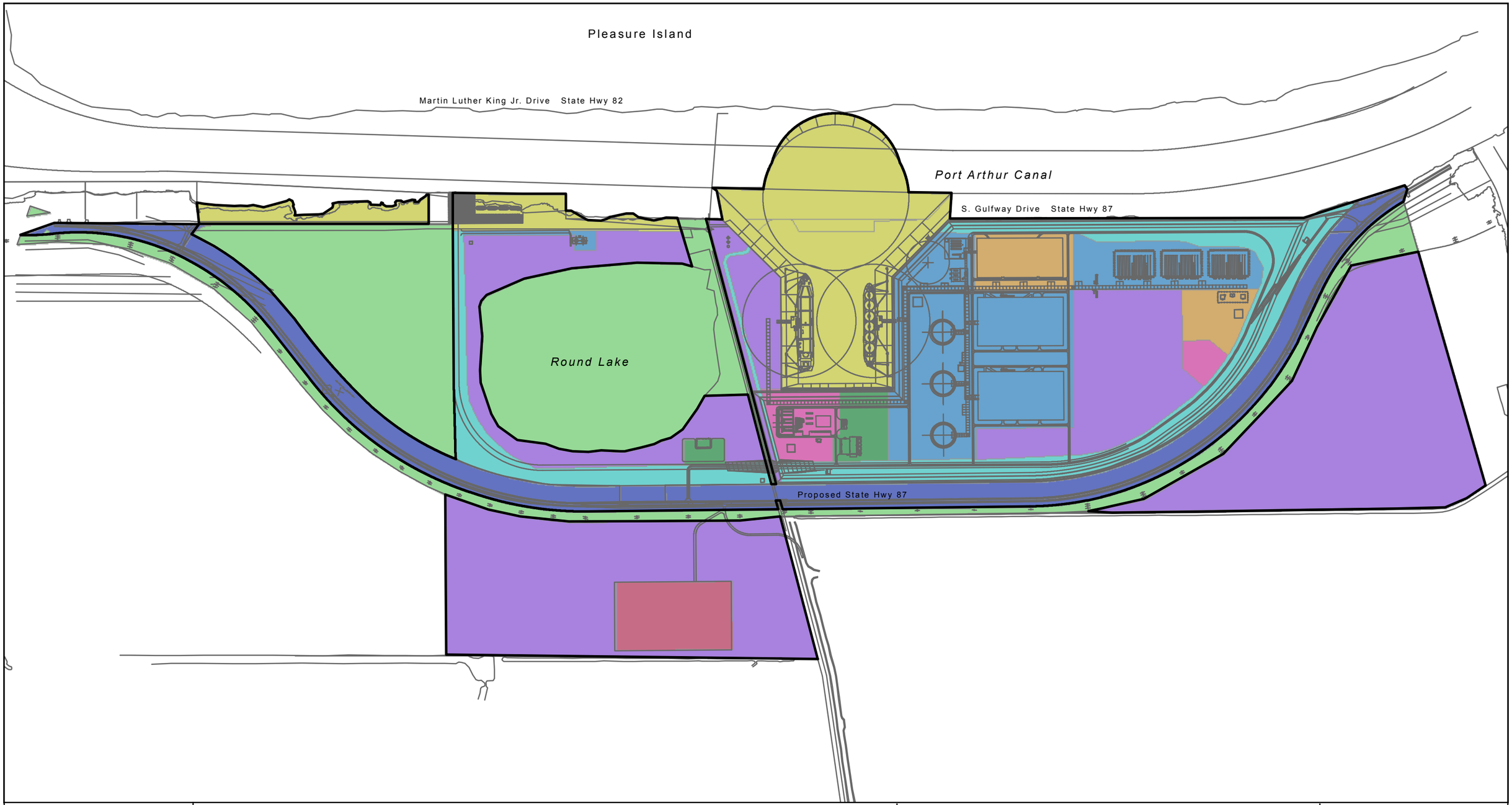
February 2016

FIGURE 1.1-4

Map Projection: NAD83 UTM15N Ft. Sources: Sempra, Open Street Map

Figure 1.2-1

Land Requirements



Site Location

Legend

- Approximate Project Boundary

Land Requirements

- Administration
- Infrastructure and Administration
- Liquefaction and Storage
- Marine
- Non-Jurisdictional
- PAPL South Compressor Station
- Internal Roadway
- Undisturbed
- Utility
- Mixed Use

N E S W

Sempra; 2016

Map Projection: NAD83 UTM 15N (US Feet)

Port Arthur Liquefaction Project

Land Requirements

0 1,100 2,200 Feet

1 inch = 1,100 feet

Port Arthur LNG

AECOM

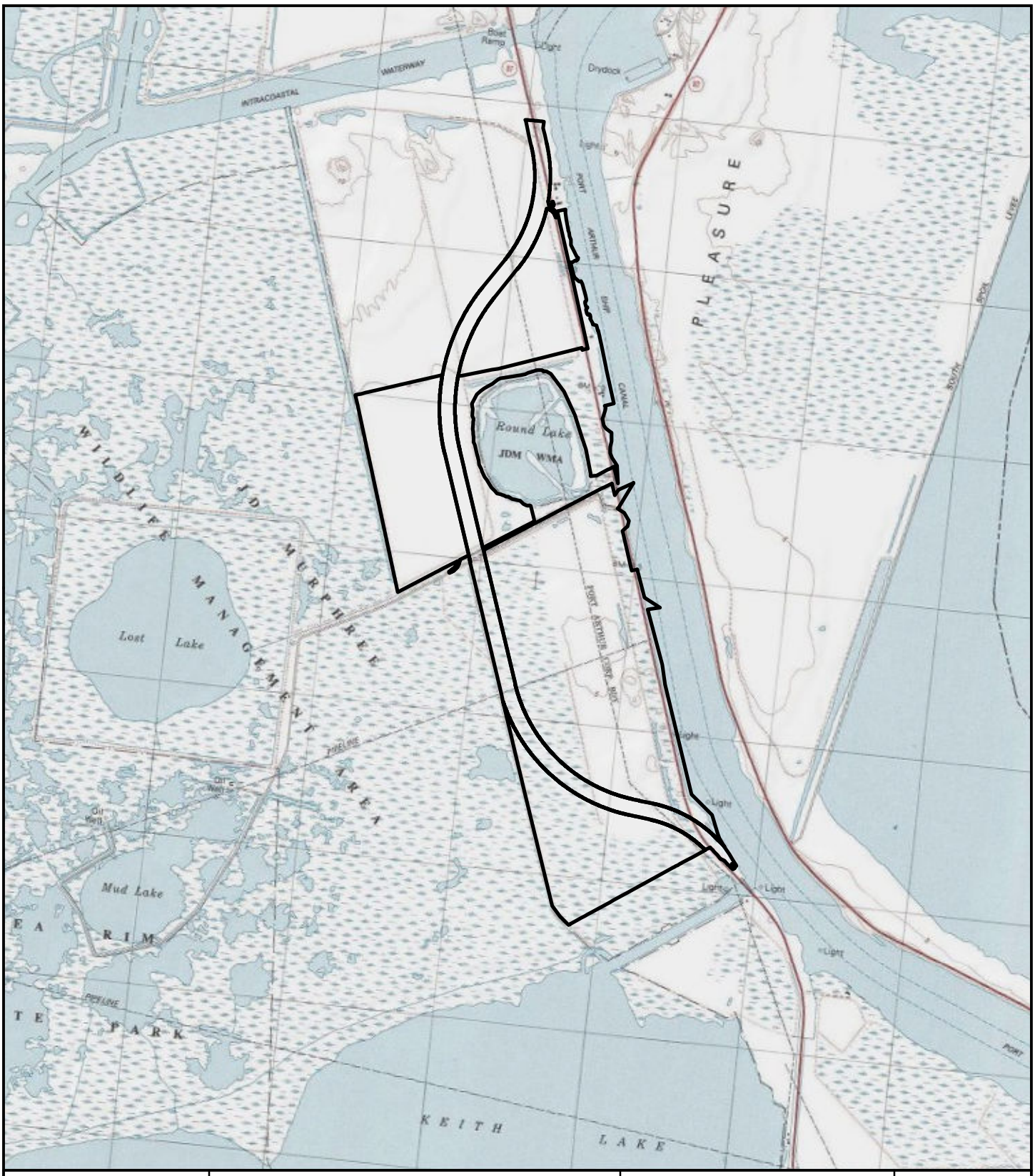
May 2016

Figure 1.2-1

Map Projection: NAD83 UTM15N Ft.

Figure 1.9-1

USGS Topographic Map



Site Location

Legend

Approximate Project Boundary

N
W E
S

Port Arthur Liquefaction Project

Topographic Map

1 inch = 3,000 feet

0 1,500 3,000

Feet

Port Arthur LNG

AECOM

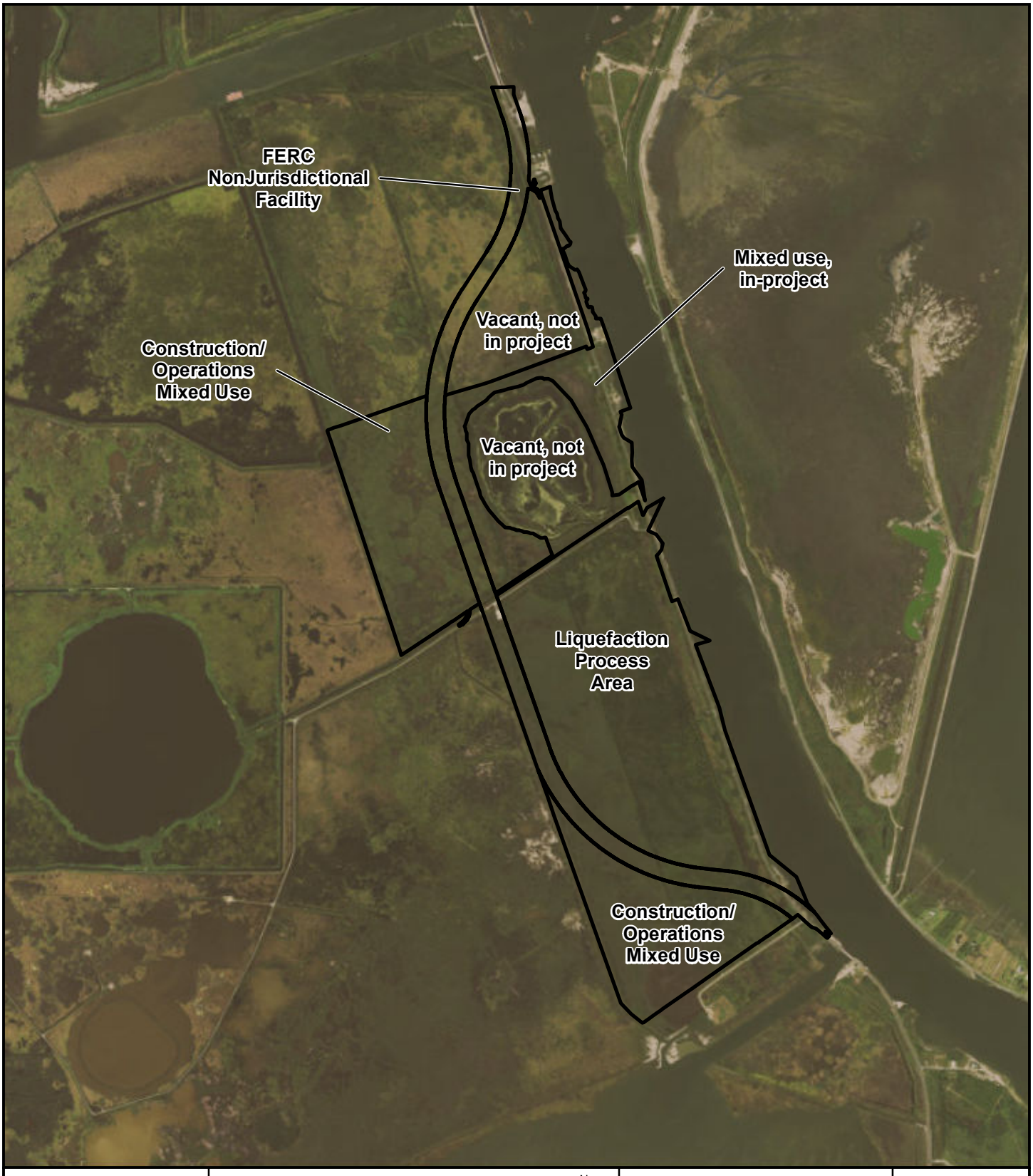
February 2016

FIGURE 1.9-1

Map Projection: NAD83 UTM15N Ft. Sources: Sempra 2016, USGS

Figure 1.9-2

Aerial Photography



Site Location

Legend

Approximate Project Boundary

N
W E
S

Port Arthur Liquefaction Project

Aerial Photography

1 inch = 2,500 feet

0 1,500 3,000 Feet

Port Arthur LNG

AECOM

February 2016

FIGURE 1.9-2

Map Projection: NAD83 UTM15N Ft. Sources: Sempra 2015, 2016

Figure 1.9-3

Aerial Photo-Base Alignment Sheet for the Highway/Pipeline Corridor Relocation

Site Location

Legend

- Utility ROW 175'
- Highway ROW 120'
- Existing Entergy ROW 100'

N
W E
S

Porth Arthur Liquefaction Project

Aerial Photo-Base Alignment Sheet
for the Highway/Pipeline
Corridor Relocation

1 inch = 2,500 feet

0 650 1,300 2,600
Feet

Port Arthur LNG

AECOM

February 2016

FIGURE 1.9-3

Map Projection: NAD83 UTM15N Ft. Sources: Sempra 2016

APPENDICES

APPENDIX 1A

Agency Correspondence

APPENDIX 1B

Environmental Plan

(Under Development)

APPENDIX 1C

List of Landowners

Privileged and Confidential Information
DO NOT RELEASE

Note – This appendix contains Privileged and Confidential Information and has been removed from the Public Version.

APPENDIX 1D

Cumulative Impacts Analysis

Cumulative Impacts Analysis

Cumulative impacts of the Project have been systematically evaluated. The following text provides an overview of the current state of cumulative impact reviews by FERC and describes the method by which PALNG has undertaken the cumulative impact review. This section also identifies past, present, and reasonably foreseeable future projects that could contribute to a cumulative impact to the environment. Cumulative impacts for each environmental resource area are discussed in each individual resource report. Because cumulative impacts are strongly affected by the environmental resource under consideration, this section also includes a table that identifies which projects are included in the cumulative impacts analysis in each individual resource report.

1.0 OVERVIEW

To support an informed decision by the Commission, PALNG assessed potential cumulative impacts attributable to the proposed Project. Cumulative effects are defined in the Council on Environmental Quality (CEQ) regulations for the implementation of NEPA (40 CFR, Section 1508.7) as "…the impact on the environment that results from the incremental impact of the action when added to the other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such actions." Although the individual impact of one project may be minor for one or more resources, the additive or synergistic effects of multiple projects could be significant. Cumulative impacts associated with the proposed Project could result from the combined direct and indirect impacts of construction and operation of the Project facilities with other past, present or reasonably foreseeable planned projects that overlap with the geographic scope and timeframe of the proposed Project. The direct and indirect impacts of the proposed Project are discussed in each individual resource report. In general, the impact contributions from other relevant past and present projects that may have overlapping cumulative impact contributions to those of the Project are included as part of the baseline conditions discussion contained in the resource reports for each individual resource.

This cumulative impacts analysis generally follows the methodology set forth in relevant CEQ (CEQ 1997) and U.S. Environmental Protection Agency (EPA) guidance (EPA 1999). Under these guidelines, inclusion of projects within the analysis is based on identifying commonalities of impacts from other projects to potential impacts that will result from the proposed PALNG Project. In addition, the U.S. Court of Appeals, District of Columbia Circuit (Grand Canyon Trust v. FAA 2002) has clarified that a "meaningful cumulative impact analysis must identify: (1) the area in which the effects of the proposed project will be felt; (2) the impacts that are expected in that area from the proposed project; (3) other actions -- past, present, and proposed, and reasonably foreseeable -- that have had or are expected to have impacts in the same area; (4) the impacts or expected impacts from these other actions; and, (5) the overall impact that can be expected if the individual impacts are allowed to accumulate."

2.0 CUMULATIVE IMPACTS ANALYSIS SPATIAL AND TEMPORAL SCALE

To develop a robust and relevant data analysis for decision-making purposes, a practical delineation of the spatial and temporal scales was selected to define the cumulative impact analysis scope for the individual resources potentially impacted by the PALNG Project. The selection of geographic boundaries and time period is based on the appropriate natural and

sociopolitical boundaries for the various resources of concern (hereafter referred to as the Cumulative Impact Assessment Area [CIAA]) and the period of time that the proposed Project's impacts may persist. The cumulative impacts analysis utilizes available data collected for other projects that meet one or more of the criteria listed in Table 1.10-1; a list of projects potentially contributing to cumulative impacts is presented in Table 1.10-2. Figure 1.10-1 presents these projects.

In terms of spatial/geographic considerations, a project must impact a resource category potentially affected by the proposed Project within a defined resource-specific CIAA. For some resource categories, the CIAA is large in size due to factors such as the dispersal of air pollutants, while for other resources the CIAA is small in size due to the limited spatial extent of the impact, such as with noise impacts or impacts to cultural resources. For example, in this analysis, potential cumulative impacts on fisheries and wildlife were considered on a broader basis while potential cumulative impacts on geological resources were considered on a small, more localized basis.

The time period into the past and future which other projects could potentially cumulatively impact the area of the proposed Project was based on whether the resource category impacts are short-term, long-term, or permanent. Most of the direct and indirect impacts related to the proposed Project will occur during the construction and operation phases. However, there will be some longer-term impacts associated with project decommissioning. For other, similar projects where the impacts are long-term or permanent, the temporal range was extended to include their impact contributions. The reasonably foreseeable future projects included in the analysis are those that are not speculative (i.e., projects with an existing formal proposal, commitment of funding or other resources, or those for which the permitting process has already begun). Table 1.10-1 identifies the CIAA for each of the resource categories the proposed Project will contribute direct and indirect impacts to, along with a brief synopsis of the rationale for how the CIAA was designated. In general, regulatory guidance documents from CEQ, EPA and FERC, along with recent published FERC EISs for energy projects, were used to select the appropriate CIAA for each resource category.

2.1 CIAA FOR WATER USE AND QUALITY (RR 2)

Water use and quality encompass several different areas over which impacts could occur on a cumulative basis. With respect to water use, projects that could substantially affect available water could result in cumulative impacts. As such consideration of projects within the local service area of the local water resource agencies seems reasonable. Fresh water will be provided to the Project by a municipal source, likely either the City of Port Arthur or the Lower Neches Valley Authority. PALNG has assumed that these providers have delivery capacity needed to support projects. PALNG has assumed that the local infrastructure within roughly a 5-mile radius could be a limiting factor for cumulative impacts. Projects using these water suppliers farther than 5 miles from the Project would not add cumulatively to PALNG's water demands.

Potential impacts to surface water quality, such as from increased turbidity or sedimentation due to dredging or other discharge are expected to settle out and/or become diluted throughout the waterbody within a distance of 1 or 2 miles. For simplicity in evaluation, the same 5-mile radius for impacts to water quality was used.

An evaluation of cumulative impacts to wetlands needs to consider potential impacts to wetlands that may share hydrologic connectivity or provide contiguous wildlife habitat. PALNG

has assumed that a radius of 5 miles would provide that connectivity and linkage to wildlife habitat.

2.2 CIAA FOR FISH, WILDLIFE AND VEGETATION (RR 3)

Similar to the CIAA for Resource Report 2, PALNG has identified a single CIAA although like for Resource Report 2, the selection of CIAAs varies for different groups of biological resources for group-specific reasons. For animals that range widely such as marine mammals or marine or estuarine fish, the sorts of projects that could result in cumulative impacts would be associated with marine facilities. The Project is roughly within 10 miles of the coast and is also within 10 miles of Port Arthur's high concentration of marine facilities.

For migratory birds that are dependent upon available local habitat, PALNG applied the same logic as for wetlands in Resource Report 2, because many of these birds would be dependent upon those wetlands. However, for consistency across the different biological resources, PALNG has assumed a 10-mile radius for potentially cumulative projects.

Finally, for vegetation, PALNG has assumed that impacts would be much more local. However, if there are habitats for special-status species that are in limited supply in the area, the potential loss of a substantial portion of those habitats within a 10-mile radius could result in a significant cumulative impact. PALNG assumed that consideration of projects within that area was reasonably conservative.

2.3 CIAA FOR CULTURAL RESOURCES (RR 4), GEOLOGICAL RESOURCES (RESOURCE REPORT 6) AND SOILS (RR7)

Cultural resources, geological conditions and potential resources, and soils all occur within site-specific locales and are generally not affected by activities occurring outside the Project designated work area. For example, project-related impacts to mineral resources are typically limited to impacts associated with current and future mineral and non-mineral mining activities rather than geologic formations and geologic hazards. The FERC Guidance Manual for Environmental Report Preparation suggests that impacts to mines and oil or gas fields be evaluated out to 0.25 mile, which also seems like a reasonable CIAA for cultural resources and soils as well. As such PALNG has assumed a CIAA of 0.25 miles for these three resource reports.

2.4 CIAA FOR SOCIOECONOMIC (RR5)

The FERC Guidance Manual for Environmental Report Preparation (2002) specifies that the socioeconomic impact area generally comprises the municipalities or counties in which Project facilities will be located or may be affected by Project activities. County and Parish boundaries are published and well-defined, and socioeconomic data are collected and published at the county level by the U.S. Census Bureau and the U.S. Department of Labor. Because socioeconomic impacts are commonly felt at the County and Parish level, PALNG has assumed that cumulative socioeconomic impacts could occur within Jefferson County. Also, because the Sabine Pass Liquefaction Project is another large LNG facility in close proximity to PALNG but not within Jefferson County, impacts from that portion of Cameron Parish are also included in the CIAA. As such, PALNG has defined the CIAA as Jefferson County plus a 10-mile radius of the Project site.

2.5 CIAA FOR LAND USE, AESTHETICS AND RECREATION (RR8)

Impacts to land use, recreation, and aesthetics generally occur fairly close to the Project site. Recreational opportunities may be affected up to several miles from the facility, while aesthetic impacts may extend well beyond the Project site depending upon the location, size, and scale of the Project. Unless there are substantial changes in land use over a large area, land use effects tend to be localized. PALNG has assumed that a 10-mile radius is sufficient to capture cumulative impacts to these resources from the Project and other similar projects given the industrial nature of the Project and the context in which it is located.

2.6 CIAA FOR NOISE QUALITY (RR9)

Because sound dissipates relatively rapidly with distance, noises from the construction and operation of the Project are expected to be limited to roughly a mile. As such, PALNG has assumed that for projects to add cumulatively they would need to occur within a mile, resulting in a CIAA of 1 mile for noise.

2.7 CIAA FOR AIR QUALITY (RR9)

Air Quality Control Regions (AQCRs) are recognized regulatory areas for air quality monitoring, reporting, and regulation. In addition, nonattainment areas (NAAs) are designated areas in that need to come into compliance with National Ambient Air Quality Standards (NAAQS), and maintenance areas (MAs) are former NAAs that have attained the NAAQS. Under the Clean Air Act (CAA), each state is divided into one or more AQCRs, and some counties are in interstate AQCR. AQCR are generally established based on geography without regard for state boundary lines and based on common air pollution problems. The State and local governments retain the responsibility for abatement and prevention of air pollution problems. Urban-industrial concentrations were a significant factor in the establishment of AQCR. Jefferson County is in the Southern Louisiana-Southeast Texas Interstate AQCR. It includes 35 southern Louisiana parishes and 15 southeastern Texas counties, including counties to the north, northeast, and east of Houston but not including Houston. This large geographic area extends over 500 kilometers (km, over 300 miles) east to west. Along the Gulf Coast, it includes the Beaumont / Port Arthur region (Jefferson County) to the west and the New Orleans region to the east. NAAs and MAs are designated because of nonattainment for a specific pollutant and in a specific geography that may or may not coincide with the AQCR boundaries. For NAAs and MAs, states (and/or local/tribal air pollution control agencies) must devise a plan which will result in attainment (for a NAA) or maintenance (for MAs) of pollutant standards, by way of strategies such as emission permits, transportation controls, and inspection and maintenance of vehicles.

Jefferson County, Texas is part of the Beaumont-Port Arthur, Texas ozone MA, which also includes Hardin and Orange Counties in Texas. This MA was established for the 1997 8-hour ozone standard when the counties were designated attainment of the standard. This area is expected to be designated attainment of the 2015 8-hour ozone standard when those designations are made (anticipated in 2017). Further to the east, five Louisiana parishes comprise the Baton Rouge, LA MA for the 1997 8-hour ozone standard. These same counties comprise a NAA for the 2008 8-hour ozone standard; however, a Clean Air Determination (attainment of NAAQS) for this area was effective on June 16, 2014. At their closest, these two MAs are approximately 195 km (121 miles) apart. Because of the dominant southern component to the monthly wind roses during the summer ozone season, sources of emissions within either MA generally do not affect the other MA.

The Houston-Galveston-Brazoria, Texas NAA for the 8-hour ozone standard includes eight Texas counties to the west of Jefferson County, and this NAA includes Chambers County, the border of which is approximately 39 km (24 miles) west of the Project site. Because this NAA is designated for ozone, projects within the NAA with the potential to emit a "major" quantity of ozone precursors (nitrogen oxide [NOx] and volatile organic compounds [VOC]) must offset the new emissions with reductions of emissions from within the area. Therefore, major projects within this NAA are not anticipated to have a cumulative impact with ozone precursor emissions from projects within Jefferson County or the adjacent parishes in Louisiana.

For Project emissions of NOx and VOC, and for other Prevention of Significant Deterioration (PSD)-regulated pollutants, Project impacts will result from construction-related emissions (engines and soil disturbance) and from operation (process emissions and LNG tanker emissions). PSD regulations cover operational emissions but not construction emissions.

Cumulative impacts from construction emissions are also only a concern if schedules overlap and if the project construction activities are proximate to each other. Construction-related emissions are low-level releases (tailpipe, etc.) for which maximum impacts occur in close proximity to the construction site. Cumulative impacts with the nearby Port Arthur Pipeline and associated compressor stations are not anticipated to be significant and will overlap for only a portion of the terminal construction duration. Additionally, emissions associated with nearby pipeline construction will be proximate to the terminal for only a portion of the construction period. Maximum impacts from construction are anticipated to occur at the fenceline or at most within 0.5 km from an activity. The nearest active project, the Sabine Pass Liquefaction Project, is located more than 6 km from PALNG. The Environmental Assessment for the Sabine Pass Liquefaction Project indicates that construction will be completed in 2017 as PALNG construction will be ramping up (no substantial overlap). Another project, PI Dock Facilities, is located approximately 3 km north of the PALNG site. However, this project began operating in 2015, so that there will be no cumulative construction impacts. In addition to these projects, the existing Golden Pass LNG Facility is located approximately 3 km from PALNG. Sources of emissions that are located more distant than these facilities are not anticipated to contribute to a NAAQS exceedance in the vicinity of the Project's construction activities.

Cumulative impacts from operation were addressed as part of the cumulative impact analysis provided as part of the PSD application for the terminal. For pollutants with project impacts that exceed significant impact levels and for fine particulate matter (PM2.5), PSD generally requires modeling all major sources within the predicted significant impact area plus 50 km (some sources may be eliminated through screening procedures). This cumulative impact modeling included a quality-reviewed source inventory that was approved by the permitting authority. Sources beyond 50 km cannot reasonably be anticipated to cause or contribute to a modeled exceedance of the NAAQS. PALNG received its PSD permit on February 17, 2016.

3.0 PAST, PRESENT, PROPOSED OR FUTURE PROJECTS EVALUATED FOR POTENTIAL CUMULATIVE IMPACTS

Where a potential for cumulative impacts was indicated, relevant project data were collected for quantitative analysis to the extent practicable; however, in some cases information on the potential impacts from other projects with overlapping impacts in a CIAA were only available qualitatively. This limited availability is particularly the case for (1) projects in the early planning stages; (2) projects contingent on economic conditions, availability of financing, and/or the issuance of permits; (3) projects for which there is a lack of readily available comprehensive information; or (4) Major Source New Source Review (NSR) permits.

Table 1.10-2 includes a list of sources used to locate existing or proposed minor and major projects in each respective CIAA which were utilized for the resource-specific cumulative impacts analyses. For projects potentially contributing to cumulative impacts, data collection, location mapping, and assignment of impact magnitude per project has been included in each resource report. PALNG will include additional projects in the cumulative impacts analysis as appropriate (i.e., if additional relevant projects are proposed during the FERC filing process that are located in one or more of the resource CIAAs) for presentation in the final EIS.

Table 1.10-1 Spatial/Geographic Criteria for Cumulative Impacts		
Resource Report (RR)	**CIAA Boundary**	**CIAA Rationale**
RR 1: General Project Description	Not applicable (N/A)	N/A
RR 2: Water Use and Quality	5-mile radius	A radius of 5 miles was selected to consider cumulative impacts to the three components of water use and quality, including wetlands. Fresh water will be provided to the Project by a municipal water provider. PALNG assumed that the infrastructure and supplies within 5 miles could be affected by cumulative projects. PALNG also assumed that surface water quality impacts would not extend beyond a mile or two from the project site. However, for consistency sake within RR2 PALNG has considered projects within the same 5-mile radius as potentially contributing to cumulative impacts to water quality, Finally, PALNG is using the 5-mile radius for potential cumulative impacts to wetlands since wetlands within that radius may share hydrologic connectivity or provide contiguous wildlife habitat.
RR 3: Fish, Wildlife, and Vegetation	10-mile radius	Potential cumulative impacts to fish, wildlife and vegetation that were considered range widely from very local to quite distant. PALNG assumed that a CIAA of a 10-mile radius despite a diversity of habitats for both aquatic and terrestrial species would be appropriately conservative to identify key potential cumulative impacts.
RR 4: Cultural Resources	0.25-mile radius	Impacts to cultural resources will be highly localized; thus, a 0.25-mile radius from the Project site will capture potential overlapping impacts.
RR 5: Socioeconomics	Jefferson County and 10-mile radius to include Cameron Parish	Because socioeconomic impacts are commonly felt at the County and Parish level, PALNG has assumed that cumulative socioeconomic impacts could occur within Jefferson County. Also, because the Sabine Pass Liquefaction Project is another large LNG facility in close proximity to PALNG, impacts from that portion of Cameron Parish are also included in the CIAA.
RR 6: Geological Resources	0.25-mile radius	Impacts to geological resources are expected to be highly localized; thus, a 0.25-mile radius from the Project site will capture potential overlapping impacts.
RR 7: Soils	0.25-mile radius	Impacts to soils will be highly localized; thus a 0.25-mile radius from the Project site will capture potential overlapping impacts.
RR 8: Land Use, Recreation, and Aesthetics	10-mile radius	Impacts to land use, recreation, and aesthetics generally occur within and immediately adjacent to the Project site. PALNG has assumed that a 10-mile radius is an appropriate CIAA to evaluate cumulative impacts given the industrial nature of the Project and the context in which it is located.

Table 1.10-1 Spatial/Geographic Criteria for Cumulative Impacts		
Resource Report (RR)	**CIAA Boundary**	**CIAA Rationale**
RR 9: Noise	1-mile radius	Noise impacts are highly localized and attenuate quickly as the distance from the noise source increases. PALNG has assumed that a 1-mile boundary will capture potentially cumulative noise impacts from other projects.
RR 9: Air Quality	PSD coverage area	Cumulative impacts to air quality are substantially different from that of other issue areas because of the wide area over which impacts from the Project and other cumulative projects can occur. PALNG is proposing to use the area included in the PSD evaluation as the CIAA for air quality.

Table 1.10-2 Cumulative Projects List									
Project	**Project Descriptions**	**Resource Report Applicable to Each Potential Cumulative Project**							
		2	**3**	**4**	**5**	**6**	**7**	**8**	**9[1]**
Golden Pass [2]	The Golden Pass LNG import terminal was constructed on approximately 477 acres located near the town of Sabine Pass, Texas on the western shore of Sabine Pass Channel. The facility started commercial operations in 2010and terminal consists of two LNG carrier berths, five LNG storage tanks, and regasification equipment for a send-out capacity of 2 Bscfd of natural gas in an existing pipeline. Subsequently, Golden Pass Products proposed to add liquefaction capacity by constructing three liquefaction trains and a pipeline expansion toserve the terminal. FERC's Final EIS is slated to be released in July 2016.	X	X		X			X	
Sabine Pass Liquefaction Project [3]	The Sabine Pass LNG import terminal was constructed on approximately 853 acres in Cameron Parish, Louisiana on the eastern shore of Sabine Pass Channel for receipt and regasification of LNG, send out of natural gas via interstate pipelines, and, subsequently, the exporting of previously imported LNG. The terminal consists of five LNG storage tanks. There are two LNG carrier berths and the LNG carrier transport distance is approximately 4 miles from the coast. Subsequently Sabine Pass received authorization to construct six liquefaction trains on the site. Construction of Train 1 is slated to be complete by early 2016; construction for Train 5 has started and construction for Train 6 is anticipated to start soon. The project is served by the Creole Trail Pipeline, Natural Gas Pipeline of America and Transcontinental Gas Pipeline. The Creole Trail pipeline was constructed to service the original import terminal and has recently completed construction of an expansion project to add capacity. The Transcontinental Gulf Trace Expansion Project began construction in January 2016	X	X		X			X	
Pleasure Island Offloading Dock[4]	Crude oil off-loading facility in Jefferson County, TX.	X	X		X			X	

Table 1.10-2 Cumulative Projects List

Project	Project Descriptions	Resource Report Applicable to Each Potential Cumulative Project							
		2	3	4	5	6	7	8	9[1]
Ryze Renewables Project[4]	Industrial recycling facility at the Port of Port Arthur in Jefferson County, TX. Plans are to retrofit two Port buildings with equipment being delivered in January 2016 and operations to start in June or July.		X		X			X	
RV Park in Port Arthur, TX[4]	Proposed RV Park in Port Arthur, TX.		X		X			X	

[1] Noise only.

[2] FERC Docket No. CP04-386, CP04-400, CP04-401, CP04-402, CP04-440, CP14-517, CP14-518, and CP15-29

[3] FERC Docket No. CP15-482, CP13-2, CP14-12, CP11-72, CP13-552, CP13-553 and CP12-351

[4] Port Arthur, City of, Planning Division. 2015. Telephone conversation between Allison Kaplan, AECOM, and Paul Brown, City of Port Arthur Planning Division, on July 27, 2015.

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Site Location

Legend

- Approximate Project Boundary
- Golden Pass Terminar & Sabine Pass LNG Facilities
- Other Project Contributing to Cumulative Impacts Analysis
- Other Linear Project Contributing to Cumulative Impacts Analysis
- County/Parish Boundary
- Hydrologic Unit Boundary (HUC12)
- Buffer (0.25 miles)
- Buffer (1 mile)
- Buffer (5 miles)
- Buffer (10 miles)

N
W E
S

Porth Arthur Liquefaction Project

Potential
Cumulative Impact
Projects

1 inch = 20,000 feet

0 20,000 Feet

Port Arthur LNG

AECOM

February 2016

FIGURE 1.10-1

Map Projection: NAD83 UTM17N Ft. Sources: US National Park Service, ESRI, USDA

Attachment 2

Draft Resource Report 10

Port Arthur Liquefaction Project

PORT ARTHUR LIQUEFACTION PROJECT

DRAFT RESOURCE REPORT NO. 10

ALTERNATIVES

PUBLIC

Submitted by:

Port Arthur LNG, LLC
2925 Briarpark Dr., Suite 900
Houston, TX 77042

May 2016

PORT ARTHUR LIQUEFACTION PROJECT

Draft Resource Report 10 – Alternatives	
To Verify Compliance with this Minimum FERC Filing Requirement:	**See the Following Resource Report Section:**
1. Address the "no action" alternative. (§ 380.12(l)(1)) • Discuss the costs and benefits associated with the alternative.	Section 10.1.1
2. For large projects, address the effect of energy conservation or energy alternatives to the project. (§ 380.12(l)(1))	Section 10.2
3. Identify system alternatives considered during the identification of the project and provide the rationale for rejecting each alternative. (§ 380.12(l)(1)) • Discuss the costs and benefits associated with each alternative.	Section 10.1.2
4. Identify major and minor route alternatives considered to avoid impact on sensitive environmental areas (*e.g.,* wetlands, parks, or residences) and provide sufficient comparative data to justify the selection of the proposed route. (§ 380.12(l)(2)(ii)) • For onshore projects near to offshore areas, be sure to address alternatives using offshore routings.	Section 10.1.3 Section 10.1.4
5. Identify alternative sites considered for the location of major new aboveground facilities and provide sufficient comparative data to justify the selection of the proposed site. (§ 380.12(l)(2)(ii))	Section 10.1.3 Section 10.1.4

Responses to Federal Energy Reulgatory Commission Comments on Preliminary Draft Resource Reports 1 and 10 – June 25, 2015	
The following comments are applicable to the Port Arthur LNG Project **Preliminary Draft Resource Report 10 - Alternatives**	
FERC Comments	**Location in RR 10**
22. Section 10.1.2.2 concludes that additions to the Cameron LNG site would likely take up most or all of the available land and, therefore, it is not a viable alternative to the project. Clarify why the size of the site prohibits the use of the existing liquefaction facility to serve as a system alternative.	Section 10.1.2.2.1
23. Discuss the feasibility of further expanding other existing and/or proposed LNG sites, including non-FERC regulated facilities, to accommodate the proposed exports amounts anticipated from PALNG.	Section 10.1.2.2 and Table 10.1
24. Describe any considerations for alternative liquefaction processes, technologies, and plant layouts.	Section 10.1.5 Section 10.3

DRAFT RESOURCE REPORT 10 – ALTERNATIVES

CONTENTS

DRAFT RESOURCE REPORT 10 – ALTERNATIVES

CONTENTS (Continued)

TABLES

FIGURES

DRAFT RESOURCE REPORT 10 – ALTERNATIVES

ACRONYMS AND ABBREVIATIONS

Bcf	Billion cubic feet
Bscfd	Billion standard cubic feet per day
CO_2	Carbon dioxide
Commission	Federal Energy Regulatory Commission
DOE	U.S. Department of Energy
FERC	Federal Energy Regulatory Commission
GIWW	Gulf Intracoastal Waterway
LCE	Lake Charles Exports, LLC
LNG	Liquefied Natural Gas
m^3	Cubic meter
MP	Milepost
MTPA	Million tonnes per annum
NO_x	Nitrogen oxide
PALNG	Port Arthur LNG, LLC
PAPL	Port Arthur Pipeline, LLC
PM	Particulate matter
Project	Port Arthur Liquefaction Project
SH	State Highway
SO_2	Sulfur dioxide
TXDOT	Texas Department of Transportation
U.S.	United States

DRAFT RESOURCE REPORT 10
ALTERNATIVES

10. INTRODUCTION

In support of its application, Port Arthur LNG, LLC (PALNG), an affiliate of Sempra LNG and Midstream, has prepared this application, which includes Resource Reports 1 through 13, in compliance with the requirements of the Federal Energy Regulatory Commission's (FERC's or Commission's) regulations for authorization to site, construct, and operate natural gas liquefaction facilities and a liquefied natural gas (LNG) export terminal under Section 3 (a) of the Natural Gas Act. Port Arthur Pipeline, LLC (PAPL), an affiliate of Sempra US Gas & Power, is filing a complementary application in compliance with Section 7(c) that will cover the feed gas supply pipeline to the Port Arthur Liquefaction Project (Project).

PALNG proposes to use approximately 890 acres of the approximately 2,900 acres of property owned by its affiliate Port Arthur LNG Holdings, LLC to site, construct, and operate the Project. The Project site is located approximately five miles south of the intersection of State Highway (SH) 87 and SH 82 near the City of Port Arthur, Texas, south of the Gulf Intracoastal Waterway and along the western side of the Port Arthur Canal, which is part of the Sabine-Neches Waterway system. The Project would be located on substantially the same site that was previously evaluated and approved by the Commission and other agencies in 2006 as an LNG import terminal in an order issued in Docket No. CP05-83. The import terminal was never built. Natural gas will be delivered to the Project through the proposed new pipeline facilities being developed by PAPL. The natural gas will be cooled into a cryogenic liquid form and stored in 160,000 cubic meter (m^3), full containment, LNG storage tanks. The proposed nominal train capacity of the liquefaction process will be approximately 12.0 million tonnes per annum (MTPA) or 6.0 MTPA per train. A marine facility capable of berthing LNG vessels will be constructed to transfer LNG onto ships.

The Project's purpose is to help satisfy the strong global market demand for liquefaction and export of domestic natural gas. In addition, the Project will offer other domestic public benefits including substantial positive impacts on the national, regional, and local economies, and improvement in the United States balance of trade. In addition, the Project would significantly enhance the anticipated reductions in global emissions of greenhouse gases that are expected to result from the export of LNG from the United States to foreign markets, by providing consuming nations with access to lower carbon dioxide (CO_2)-emitting natural gas as an alternative to higher CO_2-emitting fossil fuels such as coal and fuel oil.

This Resource Report contains a discussion and evaluation of the comparative merits of the various alternatives to the Project that might achieve the Project purpose as discussed in Resource Report 1, General Project Description, section 1.1.1 Purpose and Need. This Resource Report includes identifying potential alternatives that may reduce one or more potential environmental impacts. If an identified alternative would also satisfy the Project objectives, then other criteria, such as feasibility, were used to narrow the evaluation to a reasonable range of alternatives.

Resource Report 10 is divided into three main sections. Section 10.1 describes the various alternatives considered in the development of this Project, including subsections on the No Action alternative; system alternatives; and siting alternatives. Section 10.2 discusses Alternative Energy Sources. Section 10.3 identifies the applicant preferred Project Alternative.

The resource reports are consistent with and meet all of the requirements of the Commission. The Commission's approval and issuance of authorization for construction of the Project by the fourth quarter 2017 will be needed to allow for the startup and operations of the first liquefaction train in mid-2023 and the second liquefaction train by the end of 2023.

10.1 ALTERNATIVES

PALNG has evaluated five categories of alternatives to the PALNG Liquefaction Project including: the No Action or Postponed Action Alternative (no construction or delayed construction of facilities); System Alternatives (i.e., use of other's existing or proposed facilities or systems to achieve the same purposes); Port Location Alternatives (use of other green-field locations); Port Site Alternatives (alternative Project locations within the same property); and Alternative Facility Configurations (i.e., different facility configurations of equipment within the proposed site to optimize efficiency and reduce impacts). Each of these alternatives is discussed below. As presented in Resource Report 1, Detailed Project Description, PALNG identified a set of objectives to be fulfilled by the PALNG project. These objectives include:

- The Project needs to provide a stable supply of domestically-sourced LNG to foreign markets, thereby helping the U.S. balance of trade;
- The Project needs to provide a reliable and timely source of LNG using proven onshore liquefaction technology that can safely produce large quantities of LNG;
- The Project needs access to multiple interstate and intrastate pipelines and storage systems, providing it with a reliable source of pipeline-quality natural gas as feedstock;
- The Project needs to be developed at a site that can be readily accessed and that will have a minimal net environmental and community impact;
- The Project needs to be at a site with nearby access to existing safety and security infrastructure, such as the United States Coast Guard, and local fire and police;
- The Project needs to have ready access to a deep water channel, enabling LNG carriers to safely traverse to and from the Gulf of Mexico;
- The Project needs to have access to both major roads and barge traffic to enable delivery of large equipment during construction;

Any alternative under consideration needs to meet these objectives. In addition, the optimal Project location should have been fully vetted from an environmental perspective, enabling earlier understanding of issues during permitting. It should also be located in an area such that it would provide significant economic benefits to the local community during construction and operation.

10.1.1 No Action or Postponed Action

The No Action alternative would eliminate construction of the LNG Facility at the site in Port Arthur. The postponed action alternative would only defer construction-related effects to a future date. The principal purpose of this Project is to develop an LNG Facility to directly serve the demand for natural gas within multiple markets outside of the U.S. Further, the Project will be located in a previously disturbed site. Although the No Action alternative would completely avoid the environmental impacts associated with the construction and operation of the Project facilities and the postponed action would only defer construction-related effects to a future date, both of these alternatives could stimulate other proposals by other companies that could result in greater adverse environmental effects than those associated with the Project.

If natural gas supplies cannot keep up with worldwide demand, as expected, users could switch to alternate fuels, such as coal, or could face supply shortages. Because the demand for energy is predicted to increase, current natural gas users, particularly those without their own indeginous supply of natural gas reserves, may have fewer options for obtaining natural gas supplies in the near future. This shortage could cause natural gas customers to select other available energy alternatives such as nuclear, oil or coal, to compensate for the reduced availability of natural gas. Increased use of alternative fossil fuels such as oil or coal will generally result in higher emissions of nitrogen oxides (NO_x), sulfur dioxide (SO_2), particulate matter (PM), and CO_2 than those that result from natural gas. The use of less-clean burning alternative fuels without additional controls would also decrease global air quality by increasing the emissions of NO_x and other pollutants. Therefore, it is PALNG's view that the no action or postponed action alternatives are not viable alternatives to the proposed Project.

10.1.2 System Alternatives

System alternatives to the proposed action would make use of existing or other proposed natural gas liquefaction and LNG export facilities to meet the objectives of the Project. Implementing a system alternative would make it unnecessary to construct the Project, although some modifications or additions to existing or proposed liquefaction projects or other natural gas system components may be necessary.

A big issue with using a terminal owned and operated by another company would be sorting out logistical, safety, staffing, and financial arrangements. The simplest arrangement might be the establishment of a precinct developed by a state or local agency within which multiple proponents might locate. Issues related to dual use of facilities such as berths and supply gas pipelines could be orchestrated up front and dictated to potential site users. Such precincts have been proposed elsewhere, e.g. the Browse precinct in Western Australia. However, as shown in that precinct, coordinating all the parties to develop such a shared use site is complicated and time consuming. Given the time frames of existing liquefaction/LNG export projects in construction in the permitting process, it seems unlikely that the development of such a precinct in the Gulf region would be feasible. Furthermore, many of the same issues related to safety, logistics, priorities, and other conflicts would make sharing of facilities of other projects infeasible.

Never the less, PALNG evaluated other projects, both existing and proposed, for meeting the Project objectives discussed in Resource Report 1, Project Description, and above.

10.1.2.1 Existing LNG Export Terminals

Although multiple facilities have been approved by the Commission and are in various stages of development and/or construction, there is only one existing LNG export terminal in operation in North America, the Kenai LNG Plant located in Alaska. Due to declining natural gas reserves and well-head deliverability in the Cook Inlet region, the Kenai LNG Plant was shut down in 2013 when ConocoPhillips elected not to renew the United States Department of Energy (DOE) natural gas export license for the facility. Upon resolution of earlier issues, in 2014, ConocoPhillips filed for and received approval from the DOE to export LNG to Free Trade Countries for a two-year period. The Kenai LNG Plant exports LNG primarily to Japanese markets. Because of its remote location, it cannot economically access natural gas supplies from the southern and eastern U.S. that would be exported by the Project. Moreover, it does not have sufficient capacity to serve the specific markets to be served by the Port Arthur

Liquefaction Project. In sum, the Kenai LNG Plant is not well-positioned geographically to meet the stated objectives of the Project and cannot be considered a true system alternative.

10.1.2.2 Proposed LNG Export at Existing Import Terminals in the Gulf of Mexico

There are currently six operating LNG import terminals in the Gulf of Mexico,

- Cameron LNG in Hackberry, Louisiana;
- Golden Pass LNG in Sabine Pass, Texas.
- Sabine Pass LNG in Cameron Parish, Louisiana;
- Lake Charles LNG (formerly Trunkline LNG) in Lake Charles, Louisiana;
- Freeport LNG on Quintana Island, Texas; and
- Gulf LNG in Pascagoula, Mississippi;
- In addition to the six existing projects described above that are in the process of adding liquefaction and LNG export capacities, Corpus Christi LNG also been authorized and is under construction for liquefaction and LNG export.

Figure 10.1-1 shows the six existing facilities between Mississippi and Texas. Each of these existing operating terminals are in some stage of the regulatory review process and/or construction of additional liquefaction and export capability to the existing import terminal. Sabine Pass received its initial Order from the FERC on April 16, 2012 authorizing the liquefaction and shipping of LNG, which was subsequently amended to allow additional liquefaction and export capacity, and is well into construction. In July 2014, Freeport LNG received authorization from FERC to modify existing LNG facilities to liquefy and export LNG and is in construction. In June 2015, Freeport also filed with FERC to add a fourth liquefaction train. On December 17, 2015 FERC authorized Lake Charles LNG proposed terminal conversion and they should begin construction shortly. Gulf LNG submitted their Section 3 Application to FERC on June 19, 2015, and have subsequently responded to data requests. Golden Pass LNG submitted their draft Environmental Report in July 2014, and expect the final EIS in July 2016 with a decision by FERC by late October 2016.

Also another two proponents have filed applications with FERC and seven more proponents have filed pre-filing requests for projects in this area (Table 10.1-1) (Figure 10.1-1)

As described above, multiple companies have sought export authorizations for existing or new LNG facilities in the region. Due to the cost to develop, construct, and operate an LNG export facility, the majority of project proponents have subscribed nearly the total export capacity for their facility prior to beginning construction. As described in Resource Report 1 General Project Description, PALNG has a proposed production capacity of approximately 12.4 MTPA. This would be a significant amount of demand for any of the proposed facilities to add while they are completing the permitting or construction phases of their projects.

Additionally, PALNG is discussing various commercial offtake structures with multiple parties who have expressed interest in the LNG to be produced by the Project. One or more of these

parties may agree to share in development costs, and/or may execute long-term offtake agreements with PALNG for LNG supply and/or for processing and liquefaction services from the Project. The number of competing projects in the region illustrates that the LNG market has sufficient demand for multiple facilities to be built. PALNG does not believe it is likely that its ability to conclude commercial offtake agreements with third parties would be impacted by buyers/suppliers creating multiple new agreements with projects at various other locations in the Gulf. If it was economically feasible for PALNG's prospective customers and investors to use one or more of the other proposed project locations throughout the Gulf region, these facilities would likely require substantial expansion and additional pipeline infrastructure as part of their projects, which in turn would have additional footprints with their own environmental impacts. PALNG believes these other projects would not be economical alternatives or have the available capacity to be feasible alternatives at this time.

The following paragraphs provide brief discussions of the six operating LNG Facilities located on the Gulf Coast of the U.S and their viability of serving as a system alternative to the proposed Project.

10.1.2.2.1 Cameron LNG

In June 2014, Cameron LNG received FERC authorizations for the development of its LNG liquefaction-export project at the site of its existing LNG terminal located on about 502 acres in Cameron Parish, Louisiana, approximately two miles to the north of the City of Hackberry, Louisiana. Full construction started in October, 2014 with commercial operations expected to commence in 2018. The Cameron LNG terminal is on the western side of the Calcasieu Ship Channel at approximate river channel milepost (MP) 18.3. Once the Cameron LNG liquefaction project facilities are completed and placed in service, natural gas will be delivered to the Cameron LNG Facility via the existing Cameron Interstate Pipeline and new Columbia Gulf Transmission lateral, which connects the Cameron LNG Facility with various existing interstate pipeline systems.

The proposed Cameron LNG liquefaction project facilities will have the capability to allow export of 12 MTPA. The Cameron LNG terminal has three existing full-containment LNG storage tanks and a fourth tank is proposed as part of the Cameron LNG liquefaction project. The Cameron LNG terminal currently has the capability to import LNG or export foreign sourced LNG using existing terminal systems and two marine berths. These facilities will allow for the transfer of LNG from the LNG storage tanks onto the LNG vessels. In October 2015 Cameron LNG filed an application with FERC to add an additional two liquefaction trains (Trains 4 and 5) that would likely take up most or all remaining available (useable) land. Securing available land is often a major issue that can stymie LNG developers. Specifically, the focus is on securing a large tract of land (approximately 500 or more acres) in a coastal location. Therefore, the Cameron LNG project is not seen as a viable alternative to this Project due to the lack of available land.

10.1.2.2.2 Sabine Pass LNG

The Sabine Pass LNG import terminal was constructed on approximately 853 acres in Cameron Parish, Louisiana on the eastern shore of Sabine Pass Channel for receipt and regasification of LNG, send out of natural gas via interstate pipelines, and, subsequently, the exporting of previously imported LNG. The terminal consists of five LNG storage tanks with a total storage capacity of 16.9 billion cubic feet (Bcf) and a send-out capacity of 4 billion standard cubic feet

per day (Bscfd) of natural gas. There are two LNG carrier berths and the LNG carrier transport distance is approximately 4 miles from the coast.

In April 2012 Sabine Pass received authorization to develop liquefaction capability at the existing LNG terminal. Including amendments, Sabine Pass has authorization for six liquefaction trains for a total authorized production capacity to approximately 29 MTPA, or 4.14 Bscfd. Construction is slated to be complete for the first train by early 2016; construction for train 5 has started and construction for train 6 is anticipated to start soon.

Sabine Pass stated that it has executed sales and purchase agreements with Total Gas & Power North America, Inc. and Centrica PLC to deliver 101 Bcf and 88.3 Bcf per year of LNG, respectively. Sabine Pass states that this represents most of the anticipated LNG production from proposed Train 5. Sabine Pass states that it is negotiating for the sale of LNG from proposed Train 6.

Because the majority of the LNG to be produced by the Sabine Pass liquefaction project has already been committed to other customers, it is not a viable system alternative to the proposed PALNG Project. Additionally, Sabine Pass's two berths would not likely have enough capacity to service another 10 MTPA of export capacity. Including the original proposed four trains and the expansion to six trains approximately 689 acres (288 Stage 2, 401 Stage 3) would be used for construction and 347 acres within the existing terminal site (156 ac for Stage 1, 191 ac for Stage 2) would be used for operation (FERC order amending Section Authorization, Aug 2, 2013). Based on this simple review, sufficient land to support the construction and operation of two additional liquefaction trains may or may not be present. However, as discussed above, the complexity of constructing and operating a separate liquefaction and LNG storage operation adjacent to the existing Sabine Pass and the likely need for construction of additional marine berth(s) makes the use of Sabine Pass infeasible.

10.1.2.2.3 Lake Charles LNG

Lake Charles LNG (formerly Trunkline LNG), located on the Industrial Canal in Lake Charles, Louisiana, started operation in 1977. The fenced LNG terminal site is approximately 125 acres, although Lake Charles LNG has control through lease and ownership of approximately 382 acres. The terminal consists of three 600,000 barrel and one 880,000 barrel LNG storage tanks and a sustained send out capacity of 1.8 Bscfd, with a peak of 2.1 Bscfd. There are two LNG carrier berths, each capable of loading/unloading LNG cargos. On March 25, 2014 Trunkline LNG, whose name was changed to Lake Charles LNG on September 19, 2014, filed an application with FERC to liquefy domestic natural gas and export LNG. On August 14, 2015 FERC issued a Final EIS and their authorization on December 17, 2015.

Lake Charles LNG proposed to add three liquefaction trains, each capable of producing five MTPA each for a total output of 15 MTPA. Each liquefaction train would be capable of processing approximately 800 MMscf/d. Facilities would be constructed on an approximate 240 acre parcel that is directly to the north of the existing Lake Charles LNG import terminal. A cryogenic pipeline and feed gas pipeline would connect the liquefaction facilities with the existing LNG terminal facilities. The liquefaction project has reported a March 2018 in-service date.

Lake Charles LNG Export Company, LLC (LCE) is a jointly-owned subsidiary of Energy Transfer Equity, L.P. and Energy Transfer Partners, L.P. working in conjunction with BG Group plc to

develop a liquefaction project. LCE would purchase the LNG produced at the Lake Charles terminal from BG LNG Services, LLC, owner of the liquefaction production at Lake Charles terminal, prior to export or, as requested in a subsequent filing, as an agent for BG LNG Services, LLC. However, with the entire 15 MTPA production capability subscribed by BG Group, the Lake Charles LNG Liquefaction Project is not a viable system alternative to the PALNG Project, due to limitations in site, berthing area, and plant subscription for common facilities.

10.1.2.2.4 Golden Pass LNG

The Golden Pass LNG import terminal was constructed on approximately 900 acres located near the town of Sabine Pass, Texas on the western shore of Sabine Pass Channel. The facility started commercial operations in 2010.The terminal consists of two LNG carrier berths that allow simultaneous unloading, five LNG storage tanks, each with 155,000 m^3 in capacity, and regasification equipment for a send-out capacity of 2 Bscfd.

On July 7, 2014, Golden Pass Products LLC, a Golden Pass affiliate, submitted an application to add liquefaction and export capabilities to the existing LNG import facility utilizing essentially all of the existing facility. The Final EIS is scheduled to be released in July 29, 2016, with a decision date of October 27, 2016. The proposed liquefaction facility will include three liquefaction trains with a total production capacity of 15.6 MTPA of LNG.

According to the Golden Pass web site (http://www.goldenpassproducts.com/), the entire production is committed to the two Golden Pass Products partners, and it is therefore unlikely that an additional 10 MTPA of LNG would become available from the proposed Golden Pass liquefaction project to satisfy the demand of PALNG's prospective customers. Accordingly, Golden Pass cannot be considered a viable system alternative to the proposed Project as capacity to meet the objectives of the PALNG Project is likely not available.

10.1.2.2.5 Freeport LNG

In July 2014, Freeport LNG Development, L.P. (Freeport LNG) received FERC authorization for Freeport LNG's Phase II Modification Project and the Liquefaction Project, which are to site, construct, and operate facilities to liquefy and export domestic natural gas from its existing LNG terminal. The facility will occupy approximately 133 acres of a 276 acre property for which Freeport LNG has secured a purchase option. It will be located on Quintana Island in Brazoria County, Texas, on the northeastern edge of the town of Quintana and southeast of the City of Freeport. Full construction commenced in October 2014. The Project includes the construction and operation of a liquefaction plant with three trains, each with a capacity of 4.4 MTPA, for a total liquefaction capacity of 1.8 Bscfd. The project also includes a pretreatment plant facility located 2.5 miles north of the terminal to process the gas for liquefaction that is interconnected through the existing Freeport Pipeline to the terminal to allow bi-directional flow of gas. Freeport LNG's Phase II Project modifies the previously authorized regasification project. Specifically, the Phase II Modification Project reorients the berthing dock, LNG transfer facilities and pipelines, LNG unloading arms, and the access roads at the terminal.

On June 15, 2015, Freeport LNG sought authorization from FERC to increase the total liquefied natural gas production capacity from 1.8 Bscfd to 2.14 Bscfd. Freeport LNG is planning to add a fourth natural gas liquefaction unit to the three liquefaction trains currently under construction to increase the total export capability to about 20 MTPA LNG. Because the majority of the LNG

(i.e., 13.4 MTPA) to be produced by Freeport LNG has already been committed to an array of companies and nearly all the available land is already committed, it is not a viable system alternative to the proposed Port Arthur Liquefaction Project.

10.1.2.2.6 Gulf LNG

In October 2011 Gulf LNG began operation of their LNG import facility in Pascagoula, Mississippi. The terminal included two LNG storage tanks, a single berth to support offloading of LNG, and associated regasification and natural gas send out equipment. In June 2015, Gulf LNG submitted their application to add liquefaction and export capacity to their existing terminal. The project would consist of two LNG trains each with a nominal capacity of 5 MTPA.

Gulf LNG indicated that approximately 171 acres would be used permanently for the facility including approximately 46 acres in the Bayou Casotte Dredge Material Management Site (BCDMMS) used by the USACE Mobile District for placement of dredge material. Gulf LNG has committed compensate for the loss of capacity at the BCDMMS. Based on the limited available land Gulf LNG would not be a viable system alternative to the Port Arthur Liquefaction Project.

10.1.2.3 Proposed LNG Facilities at Approved or Proposed Export Terminals in the Gulf of Mexico

There are currently ten additional LNG import terminals located on the Gulf Coast of the U.S., in either Texas and/or Louisiana. Table 10.1-1 provides information on the closest approved or proposed LNG Facilities located within the Gulf of Mexico and their viability of serving as a system alternative to the proposed Project. The information presented in the table includes project names, locations, distance from the PALNG Project, plant capacities and expected annual export rates in MTPA. Based on the information presented in this table, only Plaquemines LNG, owned by Venture Global Plaquemines, LLC, with an expected export rate of 20 MTPA; Rio Grande LNG, owned by Rio Grande LNG, LLC, with an expected export rate of 27 MTPA, and G2 LNG, owned by G2LNG LLC, with an expected export rate of 14 MTPA have the expected annual export rates to potentially accommodate PALNG Project's objective of exporting 10.4 MTPA of LNG. However, as each of these projects is in the pre-filing process at FERC, it is far too early to determine the viability of each project and understand whether or not each could be a system alternative. Accordingly, these facilities are not viable system alternatives to the proposed Port Arthur Liquefaction Project.

10.1.3 Port Arthur Port Location Alternatives

In its 2005 FERC filing (Docket No. CP05-83), Port Arthur LNG evaluated various alternative port locations for the development of a regasification facility. In authorizing the regasification facility project, FERC determined through independent analysis that a regasification terminal south of the City of Port Arthur (at the same site as the proposed PALNG Project site) was an acceptable alternative for siting an LNG facility, with minimal adverse impacts. The same siting criteria apply today, as it is the intent of PALNG to occupy the same general site for the liquefaction facility as was previously authorized for the regasification facility.

Port Arthur Holdings, LLC, an affiliate of PALNG currently owns approximately 2,900 acres of property along the Port Arthur Canal and the PALNG Project is proposed to be located within such property. Although other greenfield sites may be available in the area, PALNG would be required to negotiate a new, long term lease on a new property instead of utilizing the existing property owned by its affiliate. In 2005, FERC evaluated impacts to the same site as the

proposed PALNG site and issued an approved certificate for the development of a proposed LNG import terminal. The environmental impacts for the proposed PALNG Project are anticipated to be very similar to those analyzed and addressed in 2005 for the LNG import terminal. These known impacts have been accounted for and addressed early in planning and developing the PALNG Project. Additionally, the proposed site location meets PALNG's requirements for the Project in terms of size, location along the Port Arthur Canal, zoning, and availability. Therefore, the Port Arthur port location was selected as the preferred Project location.

10.1.4 Port Arthur Site Alternatives

There are several areas of land suitable for development with frontage on both the eastern and western sides of the Port Arthur Canal, starting at the Gulf Intracoastal Waterway (GIWW) and continuing south to the town of Sabine Pass. Most of these areas would exhibit favorable siting criteria for an LNG Facility, as well as meeting the stated objectives of the Project. The first area suitable for development is located on the western side of the Port Arthur Canal from the GIWW, south to the Keith Lake Cut. This area is approximately 2,900 acres and approximately 50 percent of the land has been used in the past for dredged material disposal. With the exception of three businesses along SH 87, no populated areas occur, or would likely occur in the future, as the land borders the J.D. Murphree Wildlife Management area on the west and the Port Arthur Canal on the east. SH 87 follows a narrow right-of-way which separates the Port Arthur Canal from the land area. There is sufficient land area available to ensure that a suitably-sized buffer can be maintained between an LNG Facility site and the wildlife management area. Development of an LNG Facility site or any development requiring ship access to the Port Arthur Canal along this portion of the canal will require the relocation of SH 87. This area (with the exception of Round Lake, owned by the State of Texas) is owned by Port Arthur Holdings. A portion of this land area was designated as the Port Arthur LNG Regasification Terminal Site. In selecting the site location within the larger parcels of land owned by Port Arthur Holdings, the location was chosen for the following reasons:

- Remote from populated areas (including the residential areas on Pleasure Island and the three businesses located along SH 87 to the north of the Project site);
- Site location and areal requirements are consistent with Texas Department of Transportation (TXDOT) requirements for relocation of SH 87, while providing room for the LNG Facility site construction;
- Alternative routes for accessing natural gas feed supply pipelines are available without having to cross or minimize crossing wildlife management areas;
- Site area was previously disturbed for dredged material disposal as demonstrated by predominance of vegetation indicative of disturbed sites and not pristine coastal marsh;
- Site area under the ownership of PALNG's affiliate has suitable area for on-site dredged material disposal;
- Site avoids State of Texas owned Round Lake to the north and State wildlife management area lands to the west;
- Site has sufficient area to construct a slip with two marine berths capable of accommodating LNG ships up to 266,000 m^3 without adversely impacting ship traffic on the Sabine-Neches Waterway.

10.1.5 Alternative Facility Configurations

Alternative configurations of the Project site were evaluated but the number of possible alternatives was limited by the siting requirements of 49CFR Part 193 and NFPA-59A (by reference and other industry or engineering standards. Regulatory requirements stipulate that potential thermal exclusion and vapor dispersion zones remain on site, or if the zones extend beyond the property lines, those areas must either be under applicant control or not be available for development. These restrictions dictate the locations of specific pieces of equipment for the liquefaction facilities. Likewise, thermal radiation zones associated with flares require specific distances from other pieces of equipment and property lines which require specific placement of the flare facilities. Finally, the marine berthing and offloading facilities are dependent on proximity and access to the Port Arthur Canal.

The selected location of each of the Project facility components was accomplished with these guidelines and requirements, as well as minimizing the areas of land to be disturbed during the construction and operation of the Project.

10.2 ALTERNATIVE ENERGY SOURCES

Since the project is exporting LNG and not importing LNG, it will not displace alternative energy sources from being utilized. Furthermore from an environmental perspective, the export of LNG from the United States to foreign markets provides consuming nations with access to low carbon natural gas as an alternative to higher CO_2-emitting fossil fuels such as coal and fuel oil. For example, an LNG supply of 1 Bscfd has the potential to replace almost 6,400 megawatts of traditional coal-fired generation. This replacement would result in a reduction in combustion emissions of CO_2 of approximately 126,000 tons of CO_2 per day.

10.3 PALNG PREFERRED ALTERNATIVE

The PALNG-preferred Project Alternative is the construction of liquefaction and export facilities identified in Resource Report 1 General Project Description as the proposed Project. The Project, to be built on existing PALNG affiliate-owned property, previously authorized by FERC and other agencies in 2006 as an import facility, represents the best solution for meeting the stated purpose and need with the least adverse environmental effects. There are no environmental concerns that would necessitate the development of additional system or site alternatives. Consideration was given to the Optimized Cascade Process (aka Conoco-Phillips Process) for the liquefaction of natural gas. However, the APCI process was selected due to its competitive bidding opportunities for the construction of the facility and experience with the design and construction of this liquefaction process from previous projects.

TABLES

TABLE 10.1-1 Proposed LNG Facilities at Approved or Proposed Export Terminals in the Gulf of Mexico

Project	Location	Distance from Port Arthur LNG (miles)	Liquefaction Plant Estimated In-service Date	Plant Capacity (Bscfd)	Million Metric Tonnes Per Annum (MTPA)	CP/PF #
	Under Construction					
Corpus Christi LNG	Corpus Christi, TX	275	2018	2.14	13.5	CP12-507 PF15-26
	Proposed					
Magnolia LNG	Lake Charles, LA	52	2018	1.07	8	CP14-347
Calcasieu Pass LNG	Cameron Parish, LA	43	2019	1.34	10	CP15-550
Louisiana LNG	Plaquemines Parish, LA	291	2017	0.30	2	PF14-17
Cambridge Energy LNG	Plaquemines Parish, LA	322	2020	1.07	8	PF13-11
Plaquemines LNG	Plaquemines Parish, LA	282	2020	2.8	20	PF15-27
Annova LNG	Brownsville, TX	375	2017	0.94	6	PF15-15
Rio Grande LNG	Brownsville, TX	374	2018	3.6	27	PF15-20
Texas LNG	Brownsville, TX	371	2020	0.54	4	PF15-14
G2 LNG	Cameron Parish, LA	35	2021	1.84	14	PF16-2

FIGURES

Gulf of Mexico

Louisiana

Mississippi

Kisatchie National Forest

De Soto National Forest

Sam Houston National Forest

Huntsville

Bryan

Conroe

The Woodlands

Spring

Brenham

Katy

Houston

Pasadena

Missouri City

League City

Santa Fe

La Marque

El Campo

Angleton

Bay City

Freeport

Port Lavaca

Portland

Corpus Christi

Brownsville

Matamoros

San Benito

Harlingen

Colorado River

Guadalupe River

Nueces River

COASTAL PLAIN

Moss Bluff

Sulphur

Lake Charles

Vidor

Beaumont

Orange

Groves

Jennings

Crowley

Lafayette

Eunice

Opelousas

Abbeville

New Iberia

Grand Lake

Zachary

Baker

Baton Rouge

Hammond

Bogalusa

Picayune

Mandeville

Slidell

Lake Pontchartrain

LaPlace

Metairie

New Orleans

Meraux

Bayou Cane

Belle Chasse

Thibodaux

Morgan City

Raceland

Houma

Long Beach

Ocean Springs

Moss Point

Saraland

Prichard

Mobile

Daphne

Mississippi River

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

LEGEND

- PORT ARTHUR LNG LOCATION
- PROPOSED TERMINAL
- EXISTING TERMINAL
- 6 / 12 / 13 LOCATION ID

NOTE:
ALL EXISTING TERMINALS HAVE PROPOSED LIQUEFECTION EXPORT PROJECTS AS WELL

NORTH

0 40

Miles

Scale 1:2,700,000

FERC Status: Proposed Terminal

Location ID	Name/Location
1	Annova LNG, Brownsville, TX
2	Rio Grande LNG, Brownsville, TX
3	Texas LNG, Brownsville, TX
4	Corpus Christi LNG, Gregory, TX
6	Port Arthur LNG, Port Arthur, TX
9	Calcasieu Pass LNG, Cameron, LA
10	G2 LNG, Cameron Parish, LA
12	Magnolia LNG, Lake Charles, LA
14	Plaquemines LNG, Port Sulphur, LA
15	Louisiana LNG, Port Sulphur, LA
16	Cambridge Energy LNG, Triumph, LA
17	Gulf LNG, Pascagoula, MS

FERC Status: Existing Terminal

Location ID	Name/Location
5	Freeport LNG Dev., Freeport, TX
7	Golden Pass LNG, Sabine Pass, TX
8	Sabine Pass LNG, Cameron, LA
11	Cameron LNG, Cameron Parish, LA
13	Lake Charles LNG, Lake Charles, LA

Live Oak LNG

Alternative LNG Terminals

OVERVIEW

Date: 2/23/2016 Project: 60341503

AECOM Figure 10.1-1

Service Layer Credits: Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community; AECOM (2015)

Path: J:\Client-Projects\Bechtel\Bechtel_LNG_Export_Terminal\00-GIS\mxd\01_60341503_LOLNG_Alt_Terminals_Overview_20160222.mxd | Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere | User: jang_seo